TELEPHONY

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January 19, 1935

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The "Bring 'Em Back" Sales Campaign

By C. W. MOTTER

Publicity Director, Lincoln Telephone & Telegraph Co., Lincoln, Neb.

"BRING 'EM BACK!" This slogan became a household word among employes of the Lincoln (Neb.) Telephone & Telegraph Co., who, during the six weeks beginning October 16 and ending December 1, 1934, brought back into service 3,377 telephones. Hundreds of these were town and rural telephones which had been discontinued the past few years. In addition to the sale of telephones, employes turned in orders for 1,496 miscellaneous items of service (buzzers, gongs, etc.).

The results of this intensive drive for new and additional telephone service would not be startling if the company had been staging its first sales campaign. The company, therefore, points with justifiable pride to this unusual selling event which broke all former campaign records, both from the standpoint of the number of sales, and employe participation.

UNUSUAL SELLING event which broke former campaign records of the Lincoln Telephone & Telegraph Co. 3,377 telephones brought back into service during six weeks' sales drive, a net gain of 500 for the year 1934. Beatrice district is winner of the campaign with Hebron leading the commercial areas

H. F. McCulla, General Commercial Superintendent of the Lincoln Company, Supervised the Careful Preparation of This Campaign.

For a number of years the Lincoln company has conducted annually, as one phase of its well-defined and continuous program of employe sales participation, a concentrated drive for the sale of new and additional service. In the face of abnormal business and economic conditions, this year's achievements are most outstanding.

They are the result of the diligent efforts of a loyal, determined personnel each member of which went out and did his or her part to make the drive a success, and proved beyond any question or doubt the truth of that well-known sales adage, "More Interviews Mean More Sales."

Bringing back into service 3,377 telephones, the employes of the Lincoln company closely approached the campaign quota of 3,558 main and extension telephones. Turning in orders for more than 1,496 items of miscellaneous service, they exceeded their quota of 1,186.

Of the 1,197 employes on the company's payroll August 16, 1934, 713 of them succeeded in making sales during the campaign. A total of 38,538 interviews were made with 20,653 prospects. The average number of interviews per employe was 32 and the average number of interviews per sale was eight.

It took two months of careful preparation under the supervision of H. F. McCulla, general commercial superintendent, to get ready for this unusual selling event. These were busy months. Beginning with the second week in September, Vice-President and General Manager J. H. Agee and General Commercial Superintendent McCulla made a trip throughout the entire territory.

The sole purpose of this swing around the area was to observe business conditions generally, and to secure ideas and suggestions from employes as to the kind of a campaign that would be most effective and to determine when would be the ideal time to stage such an event.

Following this two-weeks' trip, it was decided to conduct the annual sale of service campaign the last two weeks of October and the entire month of November. The sales event was to be known as the "Bring 'Em Back Campaign" for, as Mr. Agee pointed out, the early fall rains, seasonable

up-turn in business and the payment of corn-hog and wheat funds made it possible for former subscribers to again have telephone service.

On October 12 the area and district commercial managers of the company gathered at the general offices in Lincoln for an all-day conference to present their ideas and suggestions about the campaign plan, which has been sent out to them in tentative form a short time before this meeting. After the conference, the general commercial superintendent's staff got busy on the suggestions adopted. The first matter disposed of was that of setting up quotas.

Front Cover of Folder Distributed During the Campaign and Featuring New Extension Telephone One-Third Smaller Than Company's Regular Sets.

In order to stimulate territory-wide employe interest in the campaign, the quotas were established to permit of accomplishment only by intensive sales work by all employes. The quota established was three main line and/or extension telephones and one miscellaneous sale per employe.

Cash Bonuses for Initiated Sales

For the first time in the history of its sales campaigns, the company offered cash bonuses for initiated business, as a special inducement to stimulate effort. All employes except general office staff men, district commercial managers, district plant-traffic managers, area commercial managers, district salesmen, exchange managers, and area salesmen were eligible to receive a bonus.

The bonus was awarded on the following basis: On each main station sold, 50 cents was paid immediately following actual installation and an additional 50 cents was paid on each station remaining in service after three months. On extensions sold, a bonus of 50 cents was paid immediately following actual installation.

According to the general sales plan for the campaign, to be eligible to receive bonus employes had to complete the sale; that is, a signed order plus the first month's rental had to be obtained. The order then had to be approved by the exchange manager, who determined the credit rating of the party ordering the service as well as the method of settling any unpaid balance owing on a former account.

Publicity and Advertising

Practically every medium known was used to publicize and advertise this unusual sales event. Advance publicity included a special edition of the Lincoln Telephone News and

Vice-President and General Manager J. H. Agee, Who Made a Trip Throughout Lincoln Territory in Company with General Commercial Superintendent McCulla, to Determine Most Effective Type of Campaign.

radio announcements in connection with the company's regular radio program presented three times each week over station KFAB, Lincoln.

The advertising and publicity used during the campaign consisted of one newspaper advertisement in weekly papers throughout the territory, while the daily papers were given a schedule of one advertisement a week.

Radio anouncements carried to thousands of listeners throughout the territory of the company, the announcement that service connection charges would be waived for the installation of main stations, extension stations, or the changing of equipment in place to a handset during this sales drive.

Booklets and pamphlets used regu-

EMPLOYE'S RECORD BB 10 C
NAME
ADDRESS
DATE COLLECTED
PROSPECT FOR SOLD
RECEIPT OF SUPERVISOR FOR AMOUNT
$

THIS IS AN ORDER FOR
BB 10 C
19
TYPE OF SERVICE WANTED
EQUIPMENT IN YES ☐ NO ☐
HAND ☐
WALL ☐
DESK ☐
WIRING IN YES ☐
NO ☐
SIGNATURE OF APPLICANT (IF NEW ACCOUNT)
PRINT NAME FOR DIRECTORY (LAST NAME FIRST)
ADDRESS
$
AMOUNT COLLECTED
DATE DUE
TELEPHONE NO.
REMARKS
NAME OF EMPLOYE
DEPT.
COMPANY ADDRESS

RECEIVED OF
CUSTOMER'S RECEIPT
BB 10 C
SERVICE CONNECTION CHARGE $
ADVANCE RENTAL $
LINCOLN TELEPHONE & TELEGRAPH CO.
BY
TOTAL $
DATE
EMPLOYE

The Specially Designed Order Blank Form Used by the Lincoln Telephone & Telegraph Co., Lincoln, Neb., in Its "Bring 'Em Back" Sales Campaign.

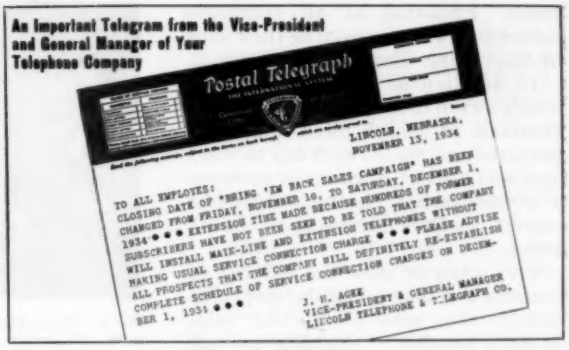
larly in the sale of service were distributed by all employes during the personal interviews.

At the larger exchanges, particular emphasis was placed on the sale of extensions by telephone. Special selling copy was prepared as an aid to those employes calling extension prospects. Generous use was made of Postal telegraph service throughout the entire campaign. This proved highly effective in stimulating sales in those areas during slump periods, as well as conveying congratulations to employes for outstanding sales performances.

Letters from the various department heads to the people under their supervision did much to enlist the support of many employes who had never before personally participated in similar sales events. One featured piece of campaign publicity was a jumbo letter sent out on November 27 over the signature of Vice-President and General Manager J. H. Agee, expressing gratitude for the sales results accomplished and urging greater employe participation the final week of the sales drive. This letter, printed on thin text paper, 19 inches wide and 25 inches high, also announced a special four-day selling event, the winners to be given a dinner and an evening's entertainment by the company.

Large, two-color posters were posted throughout the company's exchange buildings, shops and garages. These posters, cleverly illustrated, carried out the "Bring 'Em Back" theme.

There are many things that contribute to the success of a sales campaign. The most important of all is the enthusiasm and interest on the part of every employe in the organization. No campaign can be a success unless there is organized effort in which all employes contribute their very best efforts in order to do the job well. Not only must this enthusiasm be created before the start of the campaign, but it must be maintained until the very last minute.


An Important Telegram from the Vice-President and General Manager of Your Telephone Company

Postal Telegraph

LINCOLN, NEBRASKA,
NOVEMBER 13, 1934

TO ALL EMPLOYES:
CLOSING DATE OF "BRING 'EM BACK SALES CAMPAIGN" HAS BEEN CHANGED FROM FRIDAY, NOVEMBER 16, TO SATURDAY, DECEMBER 1, 1934 ••• EXTENSION TIME MADE BECAUSE HUNDREDS OF FORMER SUBSCRIBERS HAVE NOT BEEN SEEN TO BE TOLD THAT THE COMPANY WILL INSTALL MAIN-LINE AND EXTENSION TELEPHONES WITHOUT MAKING USUAL SERVICE CONNECTION CHARGE ••• PLEASE ADVISE ALL PROSPECTS THAT THE COMPANY WILL DEFINITELY RE-ESTABLISH COMPLETE SCHEDULE OF SERVICE CONNECTION CHARGES ON DECEMBER 1, 1934 •••

J. H. AGEE
VICE-PRESIDENT & GENERAL MANAGER
LINCOLN TELEPHONE & TELEGRAPH CO.

Advertising Copy Used in Newspapers in Territory Served by Lincoln Company on November 14. Extensive Use Was Made of the Telegraph During the Campaign.

Special Drives Create Added Interest

We believe the special "campaigns within the campaign" proved beyond any question of doubt, how interest can be created and maintained. There were three such drives conducted—each of them covering not more than two weeks.

The first was the "J. H. Agee Football Ticket Contest." In each commercial district two tickets to the Nebraska-Pittsburgh football game were given to the man and woman who made the most sales in the period between October 27 and November 8. The tickets also included expenses incidental to attending the game.

The second special campaign was the "Turkey Contest" staged between November 16 and 26. The rules of the contest were as follows: The man (except commercial employes) and woman in each of the four commercial districts, making the most sales during the 12-day period, was awarded one of the finest gobblers that ever strutted across any Nebraska barnyard.

Turkeys were also awarded to area commercial managers, exchange managers, or special salesmen who made the most sales in each commercial district. The drive slogan was "Remember 12 Turkeys Will Be Given Away Just Before Thanksgiving!"

The third and last special drive was the "Skyrocket Sale!" This sale was staged the last four days of the campaign. Beginning November 26 a special station quota was assigned to each of the 17 areas. To the area attaining the highest percentage of its special quota, the company announced it would give a real honest-to-goodness party, with all the trimmings, so to speak. The party was to include a dinner, three acts of vaudeville and entertainment, and a dance!

In speaking of these special campaigns within the general campaign, General Commercial Superintendent McCulla said,

"We are thoughly convinced that these special campaigns did more than any other one thing to stimulate active sales interest among those employes who according to the records of previous campaigns had never participated. We found employe enthusiasm could be aroused to new heights by offering prizes that have something of the personal interest element.

The offering of plaques, cups and citations as an incentive to the employes to give that 'extra something' has long been overworked. Employes like football games, turkeys, and parties, because they themselves have an interest in such things."

The "Bring 'Em Back" Bulletin also encouraged the employes to greater sales! This daily bulletin was used to instill enthusiasm, make special announcements and give the complete day-by-day results of the campaign by areas. All reading matter was cleverly illustrated by car-

PARTY EXTRA

FOUR BIG SELLING DAYS

"Bring 'Em Back" Bulletin

PARTY EXTRA

VOLUME 2 - NUMBER 1 LINCOLN NEBRASKA NOVEMBER 26 - 1934 ISSUED BY GENERAL COMMERCIAL DEPT

FOOD-FUN-FESTIVITY FOR THE WINNERS

BEGINNING TO DAY (NOV 26) A SPECIAL STATION QUOTA HAS BEEN ASSIGNED TO EACH AREA - FOR THE LAST FOUR DAYS OF THE "BRING 'EM BACK" CAMPAIGN. THE AREA ATTAINING THE HIGHEST PERCENTAGE OF IT'S SPECIAL QUOTA WILL BE GIVEN A "MARVELOUS PARTY" ARRANGEMENTS WILL BE MADE FOR EVERY EMPLOYE IN THE WINNING AREA - TO ATTEND

BIG DINNER - 3 ACTS OF VAUDEVILLE - DANCE - TALKING PICTURES - FUN FOR ALL - WHAT A NIGHT!

TO THE BIG PARTY!

HERE ARE THE SPECIAL AREA QUOTAS

"Bring 'Em Back" Bulletin Issued by H. F. McCulla, General Commercial Superintendent of the Lincoln Company, Announcing a "Marvelous Party for the Area with the Best Rating During the Last Four Days of the Campaign."

toons. Employes at all exchanges looked forward to receiving their copy of the "Bring 'Em Back" Bulletin.

In addition to this daily bulletin which served to keep the campaign enthusiasm at a high pitch, there was prepared and mailed each day to every area and district commercial manager a mimeographed sheet containing a contest analysis for each of the 17 areas.

This analysis gave the number of contacts for that particular day, contacts to date, sales for the day, sales to date, number of contacts per sale for the day and to date, number of employes, number of contacts per employe for the day and to date, the number of prospects and the ratio of contacts to prospects.

This daily report served to give each area and district commercial manager a true picture of the interview and sales performance, in their respective areas. The gathering, compiling, assembling, printing and mailing of all bulletins was a high speed assignment. The "Bring 'Em Back" bulletins were printed in colors and all but the mimeographed material prepared in advance.

K. B. Cary, District Commercial Manager at Lincoln, Presents Rex Winders, of the Lincoln Plant Department, With a Shiny New Half Dollar for Each Station He Sold During the Campaign.

The splendid cooperation on the part of the field representatives who called the office of the general commercial superintendent before ten o'clock each day, together with the cooperative efforts of the typists, commercial results engineers, news editor, cartoonist, mailing and printing department, all were carefully timed to get into the mail by three o'clock the afternoon of each day.

The Beatrice district won the campaign with 106 per cent of its quota sold; the Hastings district, with 104.6 per cent of its quota sold, finished in second place; while the York district, with 94.1 per cent, was in third place. The Lincoln district, with 87 per cent of its quota sold, was in fourth place.

Throughout the entire campaign intense rivalry was manifest between the 17 commercial areas. Contests of various kinds added to the intensity of the race for first place. The Hebron area, comprising seven exchanges, finished in the lead with 159 per cent of its quota sold.

Following the campaign someone asked Mr. McCulla just what this sale of 3,377 telephones meant to the company. In reply he said,

"It means that hundreds of families have restored to them the comfort and convenience and protection of telephone service; it also means that despite the 'ups and downs' of the previous months, we not only held our own, but will finish the year with a 500 net gain in telephones."

LINCOLN TELEPHONE AND TELEGRAPH COMPANY
LINCOLN, NEBRASKA

J. H. AGEE
Vice President and General Manager
TELEPHONE B4000

November 27, 1934

TO ALL EMPLOYES:

Results obtained to date in the "Bring 'Em Back" Campaign have been very gratifying and indicative of a vast amount of real sales activities.

At this moment we face the final week of the campaign and the period of the "Campaign within a Campaign" as announced in the special sales bulletin of yesterday.

We know that each and every one of you will increase your selling efforts in an attempt to make not only the station quotas assigned your respective areas for this week's special campaign, but also to put your area over the top in the "Bring 'Em Back" Campaign.

The prize offered to the employe group in the area winning this week's special campaign is one that will be enjoyed by all who participate.

We wish to express to you again our sincere appreciation of your fine efforts during the "Bring 'Em Back" Campaign. We are confident that the objectives of the campaign will be met and that we will all experience the satisfaction which comes from attaining a worth-while goal.

With sincerest personal regards,

Yours very truly,

J. H. Agee
Vice President and General Manager

This Jumbo Letter, 19 by 25 Inches, Urged Greater Participation During the Last Four Days of the Campaign.

• • •

Roumania Telephones Under Government Control

Government control of the telephones, the operation of which was granted as a concession to the International Telephone & Telegraph Co., in 1930, was announced in the London "Times" of December 7, based on a Reuter dispatch. This state intervention, which became effective December 8, is believed to be due to the interception of certain secret conversations.

The rumor that the Roumanian government is seeking an opportunity to annul the contract with the company is denied in official circles.

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Indiana Telephone Convention Set for May

W. H. Beck, of Indianapolis, Ind., secretary-treasurer of the Indiana Telephone Association, has announced that the dates for the annual convention of the association have been set for May 8 and 9. The convention will be held at the Claypool Hotel in Indianapolis.

Conductors and Insulators

THIRD ARTICLE in a series on fundamental principles of electricity involved in the operation of telephone equipment discusses conductors and insulators and their application as related to telephone circuits

By ARTHUR L. ALBERT

Associate Professor, Communication Engineering, Oregon State College, Corvallis, Ore.

IN THE two preceding articles of this series the flow of electricity in direct-current circuits has been considered. These circuits consist essentially of *conductors*, such as the wires through which the currents flow, and of *insulators* which isolate a circuit from other conductors and which confine the currents to the paths desired.

This article will discuss insulators and conductors and their application to telephone circuits. The explanations will be limited to direct-current phenomena, alternating - current transmission being reserved for a later article.

The Resistance of Solid Conductors: In the first article of this series, it was shown that the flow of electricity in a metallic conductor was a progressive motion of the free electrons in the metal. The *resistance* of a conductor, or the *opposition* a conductor offers to current flow is, therefore, determined (for a given metal) by the dimensions of the path in which the current flows.

To explain these relations, consider the piece of a copper bar of Fig. 1 having a thickness of t, a

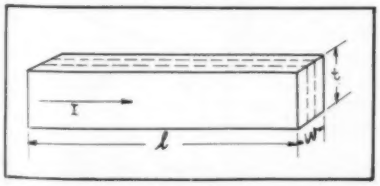

Fig. 1. Copper Bar Showing Dimensions Which Have Influence on Resistance.

width of w, and a length of l. The influence of these dimensions on the resistance, R, offered to the current I will now be considered.

For convenience, this solid bar has been considered as made up of three thinner pieces (shown dotted) placed close together as in Fig. 1. If each of these pieces were longer, the current would have to flow farther, more opposition would be encountered, more heating of the conductor would result, and hence the resistance would be greater. Thus, *the resistance of a conductor varies directly as the length, l, of the conductor.*

Now, suppose that a fourth thin piece of copper is placed alongside the three strips shown in Fig. 1, thereby increasing the width, w. The current, I, will now flow through *four* paths in parallel instead of three. From the laws of the parallel circuit, the resistance is now less. In a similar way, it can be shown that increasing the thickness, t, of a conductor has the effect of adding more current paths in parallel and of decreasing the resistance. Thus, *the resistance of a conductor varies inversely as the thickness, t, and the width, w, of a conductor.*

The relations discussed in the two preceding paragraphs can be expressed by the equation,

$R = Kl/tw \quad Kl/a, \ldots\ldots\ldots\ldots (1)$

where a equals the cross-section area of the conductor or the product tw,

Metals or Alloys.	Resistance in Ohms.
Aluminum (hard drawn)	0.000002828
Copper (annealed)	0.000001724
Iron (wrought)	0.00001057
Lead	0.0000196
Nickel	0.00000693
Silver	0.000001468
German Silver	0.000030
Manganin	0.0000478
Nichrone II	0.000109

TABLE I. Resistance per Centimeter Cube for Certain Metals and Alloys at 20° Centigrade.

the thickness times the width. The factor, K, is a constant which is placed in the equation to give the resistance, R, in ohms.

Suppose that a centimeter cube (that is, a piece one centimeter on a side) of copper is considered. Then, in equation (1), l and a are both unity, and $R = K$. The constant K is called the *resistivity* of a metal, and is *the resistance of a centimeter cube.* Values of K for various metals are shown in Table I. The last three listed are alloys.

Resistance Calculations: The application of equation (1) to various problems will now be considered. Suppose that the resistance at 20° Centigrade of an annealed copper bus bar 6 feet long, 2 inches wide, and 0.5 inch thick is desired. Such a bar might be used for connecting storage batteries together.

Since the dimensions of Table I are in centimeters, the bus-bar dimensions must also be changed to centimeters. Thus, the length is $6 \times 12 \times 2.54 = 183$ centimeters, the width is $2 \times 2.54 = 5.08$ centimeters, and the thickness is $0.5 \times 2.54 = 1.27$ centimeters. Then, using these dimensions and the value of the resistance per centimeter cube in equation (1),

$$R = Kl/tw = \frac{0.000001724 \times 183}{5.08 \times 1.27} =$$

0.0000489 ohm.

As a second illustration, suppose

Answers to Questions in Preceding Article

Here are the answers to questions, Problem No. 2, concerning principles of electricity given in the second article of this series, entitled, "The Solution of Direct Current Circuits."

A. 8.95 ohms.
B. 4.475 ohms.
C. 278.9 ohms.
D. $I = 24/278.9 = 0.086$ ampere.
E. 0.043 ampere.
F. The voltage at the subscribers' sets will be equal to IR, where R represents the equivalent resistance of a subscriber's set and I is the current through it. Thus, $0.043 \times 8.95 = 3.85$ volts. The current through the circuit consisting of the ringer, coil secondary, and receiver will be $I = 3.85/1494 = 0.00258$ ampere, or 2.58 milliamperes.

that the resistance at 20° Centigrade of an iron rod 10 feet long and 1/4th inch in diameter is desired. The length is $10\times12\times2.54=305$ centimeters. The cross-section area is

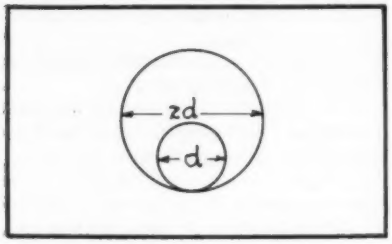

Fig. 2. Illustration Showing Relation Between Areas of Circles and Diameter.

$(0.25\times2.54/2)^2\times3.1416 = 0.327$ square centimeter. Then, from Table I and equation (1),
$R=Kl/a=0.00001057\times305/0.327=0.00985$ ohm.

The Resistance of Wires: The value of pi—that is, 3.1416—entered into the calculation of the resistance of the iron rod. This was because the rod was circular in cross-section, and the value of K was in square units. The resistance of a wire can be calculated in the same manner as the rod, but such calculations would also involve the value 3.1416.

As shown by equation (1) and the discussion preceding it, $R=Kl/a$. Now, if K is *not* in ohms per centimeter cube, but is in *ohms per mil foot*, the calculation of the resistance of a wire is simplified. That is, instead of using for K the resistance of a centimeter cube of the material, we will use for K the resistance of a wire one mil (0.001 or one one-thousandth of an inch) in diameter and one foot long.

The resistance at 20° Centigrade of a high grade annealed copper wire one mil in diameter and one foot long—that is, the resistance per mil foot—is 10.37 ohms. For hard-drawn wires the resistance per mil foot is greater, being about 4 per cent greater for small wires and 2 per cent greater for large wires.

The application of this principle to calculating the resistance of a wire will now be considered. Suppose that it is desired to calculate the resistance at 20° Centigrade of 500 feet of annealed copper wire, 0.05082 inch in diameter. Although the value 3.1416 is omitted from the calculation of the cross-section area a, this area is proportional to the diameter squared.

This can be illustrated by Fig. 2. The diameter of the small circle is d, representing the cross-section of a wire one mil in diameter. Now, suppose a wire of diameter $2d$ is drawn. The area of this circle is not twice the smaller one, but equals the diameter squared or $4d$; that is, it is four times the area of the smaller circle.

Hence, *the cross section area of a wire in circular mils is the square of the diameter in mils.* To calculate the resistance of the wire, $R=500\times10.37/(50.82)^2=5185/2583=2.01$ ohms. Note in particular that the diameter in *mils* and not inches is squared.

Wire Sizes: It is quite common to specify the size of a wire by gage numbers. Thus, exchange cables may be composed of wires of Nos. 19, 22, 24, or 26 gage. In giving the size of cable conductors and office wiring, the American wire gage, also called Brown & Sharpe or B & S gage, is used. For open-wire toll and exchange lines, however, several different gages are used.

Thus, a No. 12 open-wire copper line is not the same as a No. 12 conductor used elsewhere. Wires made according to the B.W.G. or Birmingham wire gage and the N.B.S.G. or New British Standard gage are commonly used in telephone lines.

Aluminum (hard drawn)	0.0039
Copper (annealed)	0.00393
Iron (wrought)	approx. 0.0055
Lead	0.00387
Nickel	0.0062
Silver	0.0040
German Silver	0.00036
Manganin	0.000003
Nichrome II	0.000172

TABLE II. Temperature Coefficients for Certain Metals and Alloys

In each of these systems certain relations exist among the various sizes, but these are of little importance in most work. As a matter of fact, there is a growing tendency in telephone line work to disregard the wire sizes entirely and merely give the diameter of the wire in mils. Thus, a 165-mil copper line wire has a diameter of 0.165 inch.

Effect of Temperature on Resistance: It will be noted in the preceding problems that the temperature at which the resistance was calculated was always carefully stated. The reason for this is that the resistance of a conductor is greatly influenced by its temperature.

These relations are shown for *annealed copper (only)* in Fig. 3. Thus, it appears that if the temperature of a copper wire is reduced to —234.5° Centigrade, then the resistance of the wire is zero. Actually, this point is near 273° Centigrade or absolute zero. That is, the lower part of the line dotted in is not a straight line, but it is so drawn to make possible the easy solution of problems within the range of from —50° to +200° Centigrade.

Before explaining the application of Fig. 3 it will be necessary to briefly consider Fig. 4. Here are shown two triangles, xyz and mno, each having the *same* angle, a. Now if these two triangles are plotted to scale, and measured, it will be found that $y/n=x/m$. Thus, in Fig. 3 it is evident that two similar triangles ending in R_1 and R_2 exist, and that as for Fig. 4,

$R_1/R_2=(234.5+t)/(234.5+t')$ (2)

As an illustration of the application of this principle, suppose that the resistance R_1 of a coil of wire at 20° Centigrade is 6.40 ohms, and it is desired to find its resistance R_2 at 80° Centigrade. Thus,

$6.40/R_2=(234.5+20)/(234.5+80)$
$=254.5/314.5$, or
$R_2=314.5\times6.40/254.5=7.91$ ohms.

This solution is entirely satisfactory for most work, but the curve for a particular metal must be known (or at least the point where it appears to cross the temperature line must be given). Instead of supplying these, the temperature data are usually given as in Table II. The last three listed are alloys.

By definition, the temperature coefficient of resistance is the increase in resistance per ohm of original resistance per degree Centigrade of temperature change. The application of this method is not so complicated as the definition sounds. Thus, suppose that the problem previously considered is solved by this method.

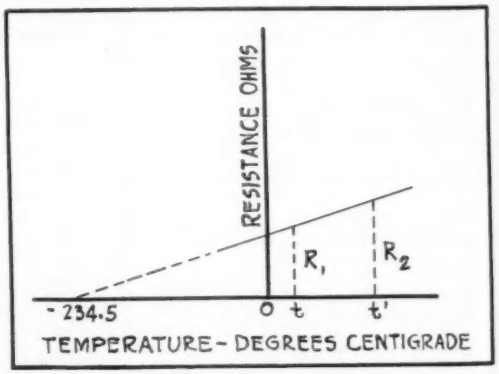

Fig. 3. Relation of Resistance and Temperature (Annealed Copper Only).

From the definition of the temperature coefficient, the increase in

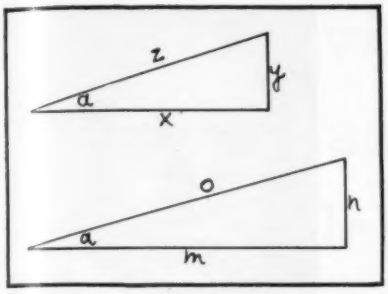

Fig. 4. Illustration of Relation of Legs of Triangles Having Same Angle.

resistance will be $6.40 \times 60 \times 0.00393 = 1.51$ ohms. Adding this to the original resistance gives $6.40 + 1.51 = 7.91$ ohms final resistance. For *hard-drawn* copper wires, the coefficient is about 4 per cent less for small wires and 2 per cent less for large wires.

Insulators: As has been previously mentioned, an insulator is considered as having only a few free electrons and, therefore, no large current flows, even when a considerable voltage is applied. The resistance of an insulator is accordingly very high. There are many types of insulating materials such as dry air, shellac, paraffin, paraffin paper, rubber, porcelain, glass, mica, dry paper, dry wood, slate, and fiber. It should be mentioned here that substances commonly termed insulators often become good conductors at high temperatures.

In general, when an insulator, as in Fig. 5, is used to support a wire, some of the current flowing through the wire "leaks off." There are two paths for direct-current leakage to the insulator pin. One path is *through* the glass, and the other is *over the surface* of the glass.

It is difficult to compute insulator leakage currents with any great degree of reliability. For example, the surface leakage depends, of course, on the condition of the surface; and this is determined by such factors as dirt on the surface, moisture in the air, and all other similar influences to which the insulator is subjected. In order to illustrate the principles, however, two simplified illustrations will be given.

Suppose that a voltage of 1,000 volts is applied between the two metal electrodes in contact with the solid glass cylinder of Fig. 6. It is desired to find the current *through* the glass, and the current flowing *over the surface* of the glass; that is, the *volume* and the *surface* leakage.

The laws governing the flow of electricity *through* the glass will be the same as those governing the flow of electricity through a conductor. The resistance per centimeter cube depends on the type of glass and the temperature. A value of 10^{15} or 1,000,000,000,000,000 ohms is a typical value. The resistance can be found from equation (1).

The cross-section area of the glass is equal to 3.1416 times the radius squared. This equals 3.1416 square centimeters. Thus, the volume resistance of the glass is $R = 6 \times 1{,}000{,}000{,}000{,}000{,}000/3.1416 = 1{,}910{,}000{,}000{,}000{,}000$ ohms. The current *through* the glass would be $I = E/R = 1000/1{,}910{,}000{,}000{,}000{,}000 = 0.000{,}000{,}000{,}000{,}524$ ampere.

For finding the current flowing over the surface of the glass, the following laws apply: First, the *longer* the surface, the longer the path, and the greater the resistance will be. Second, the *wider* the path, the more

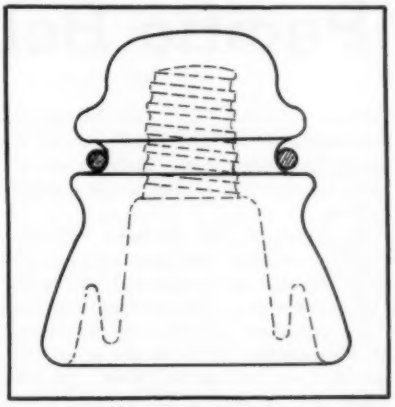

Fig. 5. Insulator Construction.

paths there will be in parallel, and the less the resistance will be. The surface resistance per centimeter cube is, as explained, a widely varying factor. A typical value would be 10^6 or 1,000,000 ohms per centimeter square.

The width of the leakage path will be the circumference of the circle or pi times the diameter, which is $3.1416 \times 2 = 6.2832$ centimeters. The surface resistance is, therefore, $R = 6 \times 1{,}000{,}000/6.2832 = 955{,}000$ ohms. The surface current leakage would be $I = 1000/955{,}000 = 0.00105$ ampere.

Summary: Since the length of the current path is increased, the *resistance* of a conductor *varies directly* as the length of a conductor; that is, increasing the length increases the resistance. Since a conductor of a large cross-section area provides more conducting paths in parallels, the resistance *varies inversely* as the cross-section area; that is, increasing the area decreases the resistance. These relations are given by equation (1).

For wires, it is convenient to use as the reference value the resistance per mil-foot: that is, the resistance of a wire 0.001 inch in diameter and one foot long. There are several systems for expressing the size of wires. Perhaps the most logical method is to give the diameter in mils or thousandths of an inch.

Temperature has a great effect on the resistance of metals. In general, *increasing the temperature causes* a corresponding *increase in resistance.* The final resistance of a conductor can be found by equation (2).

The resistance of insulators such as a glass rod cannot be calculated reliably, because the resistance varies so widely for different specimens and with test conditions. Leakage currents flow both *through* the glass and *over* the surface.

Problems:

3. Calculate the resistance at 20° Centigrade of an aluminum rod which is 4 feet long and 0.75×0.5 inches in cross-section.

4. Calculate the resistance at 20° Centigrade of a lead strap which is 20 inches long, 2 inches wide, and ¼ inch thick.

5. Calculate the resistance at 20° Centigrade of a *hard-drawn* copper wire 10 miles long and 0.25 inch in diameter.

6. The resistance of a relay winding of copper wire is 184 ohms at room temperature of 20° Centigrade. What would be the resistance at 25° Centigrade?

Work out the answers to these problems and hold them to compare with the correct answers. These will be published with the next instalment of this series of articles on electrical fundamentals, especially written for the telephone worker.

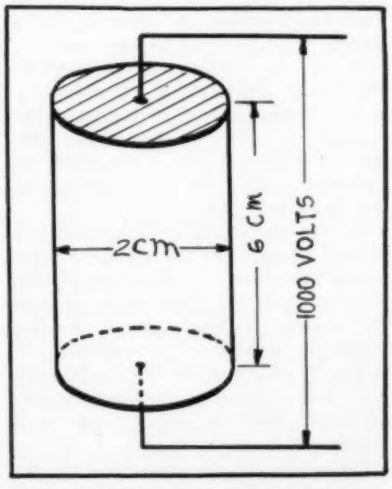

Fig. 6. Glass Cylinder to Illustrate Volume and Surface Leakage.

N. R. Powley, One of the Outstanding Bell System Executives, Was Recently Promoted from the Position of Operating Vice-President to That of President of the Pacific Telephone & Telegraph Co.

H. D. Pillsbury, for 36 Years Affiliated with the Pacific Bell, Has Been Advanced from the Office of President to Chairman of Board.

Changes in Pacific Bell Personnel

H. D. Pillsbury, of San Francisco, Calif., president of The Pacific Telephone & Telegraph Co., became chairman of the board of directors on January 3. Mr. Pillsbury's advancement came as a part of a realignment of official responsibilities in the company carried out by the board of directors. N. R. Powley, operating vice-president, succeeds Mr. Pillsbury as president, and Vice-President C. E. Fleager, Mr. Powley's assistant for the past six years, was elected vice-president in charge of operations.

Mr. Powley, who assumes the presidency of one of the largest of the Bell System operating units at the age of 49, was born at Clarkson, N. Y., and grew up in Ransomville, Niagara county, New York. After graduating from Amherst College in 1908, he entered the telephone business as a clerk with the American Telephone & Telegraph Co. in Boston, Mass., in July of that year.

In 1912 Mr. Powley was employed by The Pacific Telephone & Telegraph Co. at San Francisco and, advancing in the company step by step, he became commercial superintendent of the Southern California area with headquarters at Los Angeles in 1919.

In 1925 he became vice-president and general manager of the Southern California Telephone Co., remaining in that position until 1928 when he returned to the company's headquarters in San Francisco to become vice-president in charge of operations of the Pacific company and its associated companies, this promotion marking another step in a steady rise from the ranks.

Recognized by his associates as one of the outstanding executives in the Bell System, Mr. Powley has made many important contributions to the telephone business and brings to his new job a broad knowledge of the business and a keen appreciation of the public's point of view.

Mr. Pillsbury, who has been with the Pacific company continuously for 36 years, entered the telephone business in 1898 in the legal department and became president in 1925. He has been an outstanding figure in the telephone industry on the Pacific Coast. In his many years of service, Mr. Pillsbury has devoted himself to the highest ideals of telephone service, both to the people in the business and to the general public.

Mr. Fleager, who succeeds Mr. Powley as vice-president in charge of operations, has been in the telephone business for 35 years. He also rose from the ranks, starting as a clerk in 1899 in Chicago, Ill., and going to the Pacific coast in 1902 in telephone construction work at Seattle, Wash. He progressed steadily to become in turn foreman, construction superintendent, and district plant superintendent.

After years of experience in telephone construction and maintenance work, Mr. Fleager became the company's chief engineer for Northern California and Nevada in 1925, and assistant to the operating vice-president in 1928, a position which he held until his present advancement.

C. E. Fleager, Newly-Elected Vice-President in Charge of Operations, Has Been President Powley's Right Hand Man for the Past Six Years. He Has Been in the Telephone Business for 35 Years.

• • •

Effect of Lowered Rates in Britain

According to reports of the British Post Office, the introduction of reduced telephone rates has been followed by a material increase in the number of new subscribers.

Since October 1, 1934 (when the new rates became effective) and November 17, the increase in telephones was 73,500, whereas during September, 1934, the increase was only 21,761.

• • •

Recent Prices in the Metal Markets

New York, N. Y., January 14: Copper—Quiet; electrolytic spot and future, Blue Eagle, 9.00c per lb. Tin—Barely steady; spot and nearby, 50.75c per lb.; future, 50.65c. Iron—Quiet; No. 2, f.o.b., eastern Pennsylvania, $19.50 per ton; Buffalo, $18.50; Alabama, $14.50. Lead—Steady; spot, New York, 3.70c per lb.

Activities of Commissions and Courts

Names of FCC Members To Senate for Approval

The nominations of more than 1,500 federal officers appointed during the recess of Congress were sent to the Senate on January 10 by President Roosevelt for approval.

The huge batch of nominations included members of the new Federal Communications Commission. Anning S. Prall, former representative from New York, was named to the commission for the term expiring next July to succeed Hampson Gary, of Texas, resigned.

The names of the members for the FCC were sent to the Senate interstate commerce committee. The nomination of A. S. Prall was voted a favorable report by the committee on January 14, but action on all other appointments was delayed until the nominations could be submitted to the senators from the nominees' states.

• • •

Nebraska Depreciation Rate Hearing, January 21

The Nebraska Supreme Court has set for hearing January 21 the appeal of the Northwestern Bell Telephone Co. from the order of the commission fixing its depreciation rate for 1934 at 3.5 per cent. The hearing will be brief and confined largely to arguments upon the two main points involved:

Whether the company was given a fair and full hearing; and whether the commission has any power to act in view of the powers exercised and contended for by the Interstate Commerce Commission and its successor, the Federal Communications Commission, Washington, D. C.

• • •

Brief Filed with Ohio Supreme Court in Bell Case

The Ohio Public Utilities Commission's valuation of the property of the Ohio Bell Telephone Co. was upheld by John W. Bricker, attorney general, as fair and reasonable in a brief filed January 3 with the Ohio Supreme Court.

In another step toward settlement of the 10-year-old rate case, Mr. Bricker also maintained that rates fixed by the commission are adequate in the light of prevailing economic conditions and that refunds of $11,832,264 were properly ordered repaid by the commission.

The attorney general also contended that the only practicable method that could have been adopted was used by the commission in arriving at its findings.

The telephone company had applied to the supreme court for a review of the commission's order both as to the law and the facts.

• • •

North Carolina Rate Cut Enjoined by Court

In an order issued December 27 Judge W. C. Harris, of Raleigh, N. C., restrained the North Carolina Utilities Commission from enforcing its 12-per cent reduction in the rates of the Southern Bell Telephone & Telegraph Co., which was scheduled to become effective January 1. He granted the company's petition for a writ of supersedeas, which has abated the state commission's order pending the fiscal outcome of the telephone case in the state supreme court.

The company was required to post a $300,000 bond to indemnify subscribers for the amount of savings which may accrue for their benefit from January 1 until such time as the reduction may go into effect.

Both sides indicated they will try to dispose of the case in the courts as quickly as possible, but a trial next month will not cause the action to reach the supreme court any earlier than April when the seventh district appeals are slated to be heard.

The state gave notice of an appeal from Judge Harris' decision, but the commission is not sure it will take the matter of the writ to the higher court. Such action would serve to still further delay the reduction order taking effect. The Bell company's appeal would not be abated by any decision of the higher court against the supersedeas writ but would have to be heard after the spring term of the supreme court.

• • •

Rate Findings Denounced at Oregon Injunction Hearing

On January 7 a hearing was held in Portland, Ore., before Circuit Judges Tucker and Lusk, sitting en banc, to consider the suit of the Pacific Telephone & Telegraph Co. to enjoin the recent order of Commissioner Charles M. Thomas reducing the company's rates about 8 per cent.

Walter J. Dodge, general commercial manager of the Oregon area of the company, who was on the witness stand most of the day, explained repeatedly that Commissioner Thomas' statements, in issuing the reduction order, were "misleading" and "inaccurate."

Mr. Dodge's criticism came in the midst of presentation of a mass of statistical reports, summarizing portions of the previous record of the case and including new complications which have developed since the order was issued, October 11, 1934.

Commissioner Thomas' comparison of the Pacific Telephone & Telegraph Co., and the West Coast Telephone Co., showing how the former operated at a loss while the latter operated at a profit, was rapped by Mr. Dodge. He said that the Pacific company operated more exchanges, paid more taxes and gave service to 3,800 farmer lines as compared to 1,700 for the West Coast system.

The second point made by Mr. Dodge was that the company's revenue would be much less than the commission calculated, even by using the commission's own statistical findings.

Commissioner Thomas had given the return of the Pacific company at 7.34 per cent. Mr. Dodge showed how the figure would be 5.08 per cent, using the commission's data and figuring the loss in inter-city business.

Again using the commission's own findings, Mr. Dodge reduced the company's theoretical return under the proposed new rates from the 5¼ to 6 per

COMING CONVENTIONS

Minnesota Telephone Association, Hotel Lowry, St. Paul, January 29-31.

Nebraska Telephone Association, Hotel Lincoln, Lincoln, February 13 and 14.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, February 26 and 27.

Wisconsin State Telephone Association, Park Hotel, Madison, March 5, 6 and 7.

Oklahoma Utilities Association, Hotel Biltmore, Oklahoma City, March 12 and 13.

Texas Telephone Association, Dallas, March 25, 26 and 27.

Ohio Independent Telephone Association, Hotel Deshler-Wallick, Columbus, May 1 and 2.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 8 and 9.

cent cited in Mr. Thomas' order to 3.5 per cent.

C. E. Fleager, San Francisco, Calif., operating vice-president of the company, aimed the last rap of the day at Commissioner Thomas' order in the 15 minutes he testified on the valuation of the company outlined in the order. He introduced an analysis in which he showed that the total for the intrastate property of the company should be $30,508,210 instead of $20,825,000 as set by Commissioner Thomas.

The issue in the opening day's testimony was whether the Pacific company had presented material in addition to the records already accumulated in the case. If the court decides that new material has been presented—considering as such the compilation made since the order was issued—all of it will be referred back to Commissioner Thomas for review before the trial continues, according to state law.

• • •

High Court Reverses Order Enjoining Rate Increases

A decision of the superior court at South Bend, Ind., by which the Indiana Public Service Commission and the Laporte County Telephone Co. were enjoined from enforcing a new schedule of increased telephone rates, has been reversed by the Indiana Supreme Court.

The injunction suit was brought by the city of Laporte, the Laporte Chamber of Commerce and the Laporte County Farm Bureau. The lower court enjoined the rates, but refused to grant a writ to prevent the sale of $47,500 in new securities and to prohibit the enforcement of the commission's order fixing the valuation of the company for rate-making purposes at $954,005.

The supreme court held that "where there is evidence supporting the commission's order of such a substantial

(*Please turn to page* 29.)

The Operators' Corner

By MRS. MAYME WORKMAN
Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

HANDLING tributary toll traffic. Suggestions to tributary operators for improving this service. Series No. 177.

A COMMON complaint registered by tributary operators is, "delay encountered at toll center offices in accepting their long distance calls." This is also given as a reason for not holding the calling party on the line. In order to give satisfactory toll service to tributary subscribers we must have cooperation between the toll center and tributary exchange.

While there are instances in which the tributary operator's complaint is justified, other cases are found where the tributary is inclined to find fault with the service rendered at the toll center office when only infrequent cases of delay are encountered. It has been the writer's experience in investigating these complaints that usually operators at both tributary and toll center offices are at fault to some extent.

Tributary subscribers are entitled to the same class of toll service as that rendered to subscribers in the toll center exchange. The tributary operator wishes her subscribers to have the best possible toll service and the toll center operator, having an equal responsibility to the tributary subscribers as that to her own customers, is also anxious to render satisfactory service to the tributary subscribers.

In service-observed offices, observations are taken on toll calls originating at tributary exchanges, as well as on calls originating in the toll center office. If the toll center operator fails to answer the tributary operator's signals promptly, fails to time their calls accurately, or if any other irregularities are incurred in handling the call, these errors and irregularities are reflected in the service observations.

Since the tributary subscriber's service is in question, let's find out what the tributary operator can do to improve her customers' toll service. First we must consider there are several methods of handling tributary toll traffic and the quality of the service rendered will depend to some extent upon the method in effect in your exchange.

There is the method where the tributary operator records the call, passes it to the toll center, takes all reports from the toll center and relays them to the tributary subscriber. This is the slowest and most expensive method of handling toll calls from the tributary standpoint.

There there is the method where the tributary records the call, passes it to the toll center and then connects the tributary subscriber with the toll center and the toll center operator deals directly with the tributary subscriber from this point. This is a speedier and less expensive method.

The third method is where the tributary operator connects the tributary subscriber with the toll center, as soon as she learns he wishes to place a long distance call, and the tributary operator makes no record of the call. This is the speediest and least expensive method of handling tributary toll traffic for exchanges where toll calls can be handled in accordance with this method.

In offices where the tributary operator records the ticket and then passes it to the toll center, we frequently find the tributary operator announcing the call something like this: "I have a ticket for you," or, "I have a call to Chicago, hon," (short for "honey"). In announcing a call to the toll center it is only necessary to say one word, "Ticket." (The toll center operator will find out where the call is to when you give her the ticket details.) When the toll center is ready to take your call she will answer by saying, "Ready."

The tributary operator should avoid all unnecessary conversation as this results in delay in advancing calls and answering signals. Be business-like in all your dealings with customers and other operators. In taking ticket details from your subscribers, be sure and get all the necessary information to complete the call, and, when possible, hold the calling party on the line.

In answer to question No. 1, an operator should *never* tell a customer she is too busy to work on his call. How would you like to have a clerk in a store tell you she was too busy to wait on you? You would more than likely walk out in a "huff" and decide not to trade in that store again.

Questions from Illinois Operators

1. When using CLR service, shouldn't a toll center operator, when too busy to work on a call, give some reason to the subscriber instead of saying: "I'm too busy to work on it now"?
2. When taking a toll call, should you hold the subscriber on the line?
3. How is it possible to train subscribers to call by number rather than by name?
4. On a call from a pay station, the elapsed time showing one minute ten seconds, is the call timed one minute or two minutes?
5. How many personal city calls should you take from a pay station without charging him five cents?

For the answers to these traffic questions, please turn to page 27.

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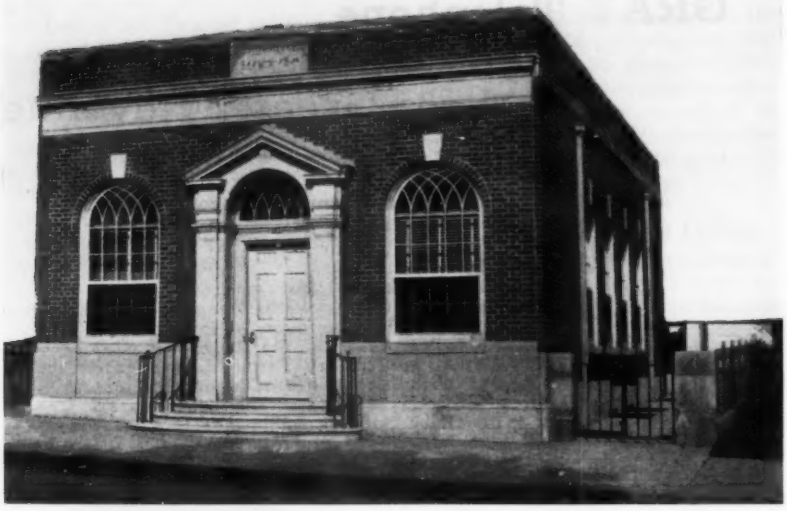


Fig. 1. The New Exchange Building of the Columbia Telephone Co. at Elizabethtown, Pa., Represents an Excellent Blending of the Artistic with the Practical

UPON the completion of the work of modernizing its central office exchange and plant in Elizabethtown, Lancaster county, Pa., the Columbia Telephone Co., with main offices at Columbia, Pa., finished a program planned some time ago for the complete rebuilding of its plant serving 3,600 stations within the boroughs and surrounding rural territories of Columbia, Marietta, Mount Joy and Elizabethtown.

The Stromberg-Carlson, seven-position, common battery switchboard at Columbia has been rehabilitated, associated line and multiple jacks have been installed and multiple cables from the switchboard to the main distributing frame have been replaced.

At Marietta, a new residential building was purchased and remodeled and the two-position, Kellogg switchboard was rebuilt and a new main distributing frame installed. New underground and aerial cables were placed to connect with the exchange and to replace various open-wire leads.

A complete new, three-position 600-800 line, Kellogg masterbuilt switchboard was put in service at Mount Joy in a building purchased and rebuilt by the company. Trunk lines to Manheim and Marietta were retransposed and overhauled, and several rural switching company lines were taken over and rebuilt.

Where necessary, subscribers' station equipment and wiring has been renewed, poles and lines replaced, additional aerial and underground cables installed. With the completion of the work at Elizabethtown, the Columbia Telephone Co. provides its customers over its entire system with local and long distance service comparable to any in the country.

The new building at Elizabethtown is a fireproof, one-story structure, especially designed and constructed not only to house the telephone exchange but to harmonize with the more modern residential buildings in the neighborhood in which it is located.

The foundation, floor and roof are of reinforced concrete construction and the walls of colonial brick offset with a trim of granite and Indiana limestone. Fig. 1 is an exterior view of the building and shows the well-balanced arrangement of the windows and front entrance and illustrates the architectural treatment for the blending of the artistic with the practical.

In the floor plan (Fig. 2) a general idea is given of the layout for the public lobby, telephone booths, operating and terminal room, operators' restroom, lavatories and battery room, together with the relative locations of the equipment and interior furnishings.

The floors are covered with acotile and linoleum cemented to the concrete and treated with a coat of liquid wax. This affords a practical, long-wearing floor which makes a pleasing appearance, is readily cleaned and helps to eliminate relay contact trouble which is common in exchanges having wood or painted concrete floors.

Armstrong "corkoustic" is used on the ceiling in the terminal and operating room. This reduces to a minimum undesirable noises in the operating room. Furthermore, with this treatment of the ceiling, it was possible to eliminate a partition between the operating room and terminal room which would have given both rooms a crowded, cramped-up appearance and would have interfered with the light and ventilation of both of them.

The switchboard shown in Fig. 3 is a Stromberg-Carlson, three-position, 1,100-line, common battery board. It

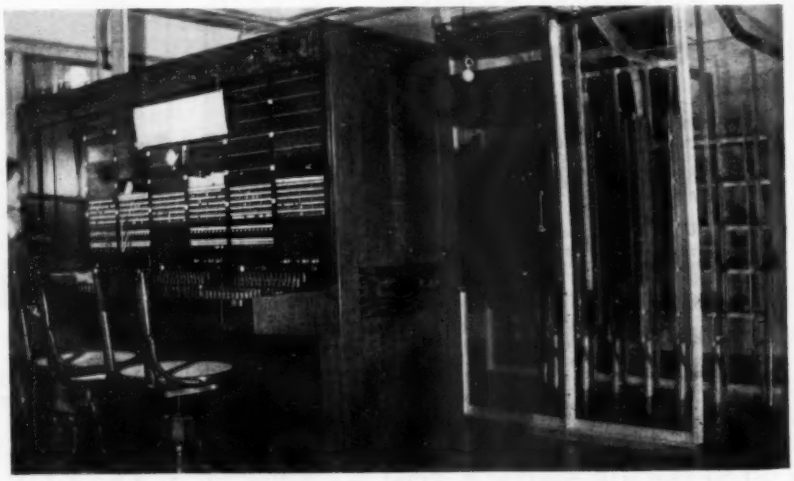


Fig. 3. Operating and Terminal Room of the Columbia Telephone Co. at Elizabethtown, Pa., Showing Three-Position, 1,100-Line Stromberg-Carlson Common Battery Board

ompany Looks To Future

By J. F. BROWNE,
Superintendent, Columbia (Pa.) Telephone Co.

FINE EXAMPLE of wisdom and foresight. The Columbia Telephone Co., of Columbia, Pa., not only believes that better times are in view for the telephone industry but is convinced that preparedness has an important place in this business as well as others. Work of rehabilitating and modernizing its entire plant has now been completed

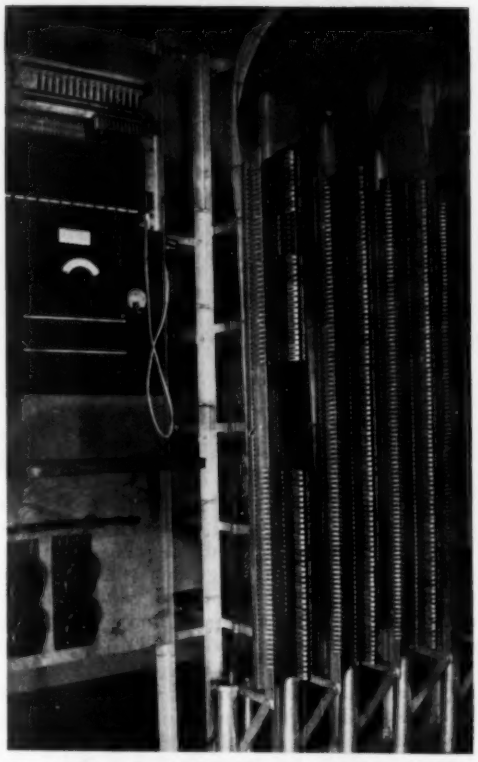


Fig. 4. Test Panel, Repeating Coil Rack and Main Distributing Frame at Elizabethtown, Pa.

is equipped with 300 local, 40 magneto and 20 trunk lines, and serves about 1,000 stations. The associated line and multiple jacks are arranged on a three-panel basis and provides each operator easy access to every local, rural or trunk jack.

Each position is equipped with universal cord pairs and four-party semi-selective ringing keys and the wide keyshelves facilitate the making out of toll tickets by any one of the operators. Ample space was allowed between the switchboard relay bay, and main distributing frame for the convenience of the workmen and for the future growth of the equipment.

To save space and to eliminate unnecessary wiring and cabling, the test board and repeating coil rack were located at the end of the main distributing frame as shown in Fig. 4. In addition to the usual talking, testing and

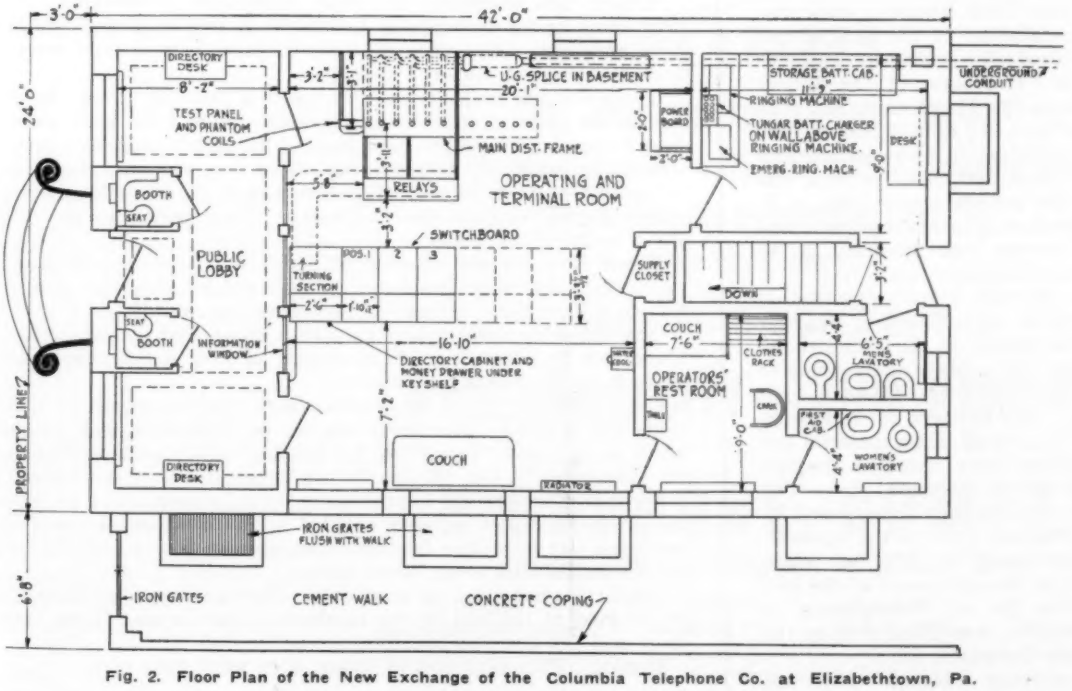


Fig. 2. Floor Plan of the New Exchange of the Columbia Telephone Co. at Elizabethtown, Pa.

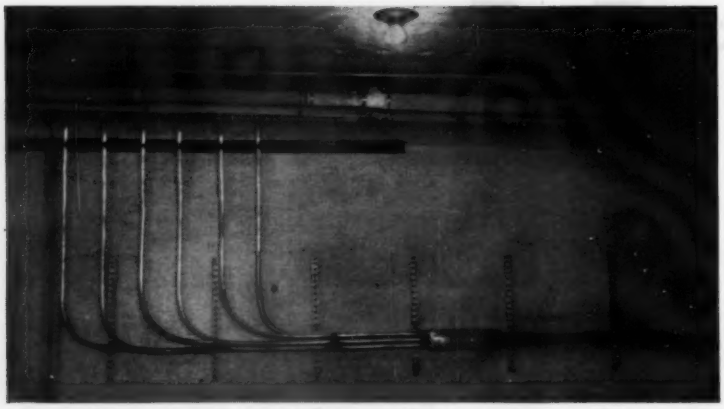


Fig. 5. Underground Entrance Cable at Elizabethtown, Pa., Showing Neat Arrangement of Silk and Cotton Cables Extending from the Main Distributing Frame Terminals

ringing equipment, the test board is provided with toll line test jacks and the phantom coils are located on either side of the panel below the test board.

The electric power and telephone cables enter the building from the rear through underground fiber conduits and provision was made in the basement below the main distributing frame for a neat, accessible arrangement of the silk and cotton cables extending from the main distributing frame terminals to the underground cable, as shown in Fig. 5.

The outside plant work was handled entirely by the regular force of the Columbia Telephone Co. employes under Thomas McCarty, line foreman, and Paul Bransby, cableman. The installation of the switchboard and central office equipment was done by Wm. T. Moore, of the United Telephone Co., Harrisburg, Pa., with the assistance of Robert Donley, wire chief, of Columbia. The engineering of the plant and building work was under the general supervision of H. A. Oberdorf, general manager, and J. F. Browne, superintendent of the Columbia Telephone Co.

The contract for construction of the central office building, together with the laying of the underground conduits and building of the manhole was awarded to Hoffer Brothers, contractors and builders of Elizabethtown, Pa., and all labor, material and furnishings were supplied through Elizabethtown dealers.

The magneto equipment used at Elizabethtown, prior to the cut-over, was purchased in 1924, at which time all of the equipment of the Bell Telephone Co. of Pennsylvania in that territory was taken over by the Columbia Telephone Co.

In carrying through with the plans to eliminate the weak spots in its telephone plant during the past few trying years, the Columbia Telephone Co. has been able to keep intact its organization of employes and to provide work for additional workmen and business concerns, a fact which is not only appreciated by the employes but by the public as well.

In 1895, Harry C. Young organized the Columbia Telephone Co. and served as its president and general manager up to the time of his death in 1912. Mr. Young was active in the working out of problems of the Independent telephone business in the early days and the "old timers" may recall him as the first vice-president of the National Independent Telephone Association in 1897.

H. A. Oberdorf, who succeeded Mr. Young as general manager in 1912 and later was made a director of the company, has been connected with the company since 1902 and has been active in telephone association work for a number of years. At present he is a director in both the U. S. Independent Telephone Association and the Pennsylvania State Telephone & Traffic Association.

Years of careful planning and financing by Mr. Oberdorf, together with the close cooperation of Mrs. Esther F. Young, president; Dr. S. S. Mann, vice-president; Charles E. Taylor, secretary and treasurer, and the following directors, Capt. C. E. Lenig, Horace Detwiler and Mrs. A. D. Smith, has made it possible for the Columbia Telephone Co. to carry through with the recent work of improving and expanding its service and to maintain its position as one of the outstanding progressive Independent companies of Pennsylvania.

ECONOMY

By MISS ANNE BARNES,
Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

Proper tree trimming is a very particular undertaking. Yet, how many awful examples of ignorance in tree trimming one sees here and there. One does not have to know how to trim trees to recognize a good job or a poor one.

There are few people within the last five years or so who haven't had to cut down on their living expenses. Some folks know exactly how to go about it; some have learned through experience; others, like the ignorant tree trimmer, cut where they shouldn't, and failed to cut where they should. The last named do everything except retrench and regulate their expenses. They belong to the "Rob Peter to pay Paul" class.

There is a certain amount of discipline in economizing and sacrificing, but never stinginess. People command respect who try to live within their means—if they have any means.

The following suggestions may help those who do not seem to know how to adopt a practical course, to trim down unnecessary items from their living expenses:

First: Do not go to the stores where you are promised something for nothing. Merchants are not in business to sell without profit, or at a loss. "Something for nothing" really means, "Nothing for something." Cut off this foolish expenditure. Cut ruthlessly.

Second: An employe is entitled to what he earns, and no more. An employer is just as much entitled to full measure service from employes. It is proper business management to see that he gets it. He should trim away "dead timber."

Third: Do not count on short cuts. They are unreal mirages. A pot of gold at the end of the rainbow. False hopes. Trim them away and get down to realities.

MORAL: Plan your cost of living, then work your plan.

Answers to the Traffic Questions on Page 22

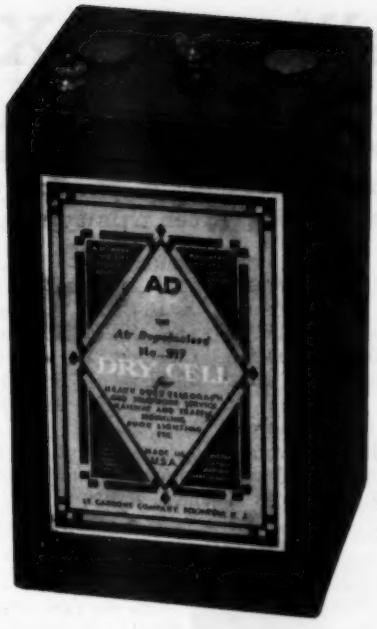
1. The answer is given in the introduction.
2. Ordinarily the calling party is held on the line. On special classes of calls, such as sequence lists of five or more calls, a point to which a delay is posted, a call charged to a third telephone or a coin-box at the called point or an indefinite address of the called party, the operator will tell the calling party he will be called if he is holding the line. The calling party is also dismissed upon the completion of recording a messenger call.
3. By following the standard operating routine for handling calls passed by address name.
4. The 15-second timing allowance applying on calls originating at pay stations, one minute would be entered on the ticket.
5. It is usually customary to charge five cents for each local call originating at a pay station. According to the standard operating practice, the telephone company does not guarantee to reach a particular party on calls of this kind. They reach the called number and collect five cents, if the call originated at a postpay telephone. On a prepay, the operator rings the called number. If the number does not answer she returns the coin.

Ohio Bell Has Station Gain in Columbus

The Ohio Bell Telephone Co. had 2,150 more telephones in service in the Columbus (Ohio) exchange at the close of 1934 than it did at the close of the previous year according to a recent report.

This was the first year since 1929 in which the company had made a gain in that city. The heaviest loss in any year during that period was in 1932 when 10,505 telephones were dropped from service. In 1930 the loss was 728 and in 1931, 1057, while in 1933 the decline was 3,702. All of the losses followed a net gain of 4,804 stations in 1929.

The amount of new business obtained in Columbus for each of the last three years is approximately at the same level, the number in 1934 being 11,873, compared with 10,692 in 1933 and 11,561 in 1932. There are now approximately 62,579 telephones in service in Columbus.



No. 517

Rating { 200 Amp. hr. / 200 M. A. Continous / 3 Amp. Max Intermitten

Size: 4½x4½x7½ inches

Weight: 6 pounds

A NEW CELL...

You Need It for

MAGNETO CENTRAL OFFICE

OPERATORS' TRANSMITTER SUPPLY

FEATURES

DRY—SELF-CONTAINED—LIGHT WEIGHT

NO Water to Add — Acids to Spill — Creeping Salts

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General Offices and Works: BOONTON, N. J.

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REPRESENTED IN Argentina, Australia, Belgium, Czechoslovakia, England, France, Germany, India, Italy, New Zealand, South Africa, Sweden.

"Selling" PBX's

INDIANA COMPANY carried on intensive campaign for PBX installations with most satisfactory results. General Manager R. V. Achatz tells of methods used in going after this type of business

IN THESE DAYS of increased utility taxes and reduced revenues, telephone operating companies are turning their attention more and more toward other than the usual sources of revenue. Of these, one of the most logical sources of revenue is the sale of private branch exchange systems.

When PBX is brought up as a subject, however, the argument is immediately raised that every telephone company sells PBX installations, that it is the usual thing to do. To refute this argument, it may be said without fear of misstatement that many telephone companies do not "sell" their PBX installations. All too often it is only an example of "letting circumstances take their own course." When someone applies for a PBX system, a contract is dusted off, filled out and signed. The cash is accepted and the transaction marked down as a sale.

To the Left, Is the Stromberg-Carlson No. 101 P.B.X. Installed in the James Walsh Co., Inc., Offices, at Lawrenceburg, Ind.

Above Is Shown the No. 104-C Cordless P.B.X. Installed in the Offices of the Martin Bros. Box Co. at Aurora, Ind. To the Right May Be Seen the No. 102 P.B.X. of Joseph E. Seagram & Sons at Lawrenceburg.

The Southern Indiana Telephone Co., of Aurora, Ind., is one of those companies which has carried on an intensive campaign for this type of business for several years, with the result that today it is unusually well situated in this regard.

It is now serving two Aurora firms, the Stedman Foundry & Machine Works and the Martin Brothers Box Co., with PBX service and also five concerns at Lawrenceburg, namely: the Lawrenceburg Roller Mills Co., A. D. Cook Co., pump manufacturers, and three distillers, James Walsh Co., Inc., the Old Quaker Co. (subsidiary of Schenley Products Co., New York), and Joseph E. Seagram & Sons.

In commenting on the methods his company has used to obtain this business, R. V. Achatz, general manager of the Southern Indiana Telephone Co., has this to say:

"In connection with our PBX service which has been installed in our territory during the past year, we are not sure that there are any particular items in our method of campaign that differ from any other selling proposition. The principal elements have been: First, find the prospect; second, prepare a definite proposition; third, present the proposition at a favorable time; fourth, follow up the prospect until service is definitely sold.

Several years ago, we studied the various industries in our community, and listed the prospects for PBX service. As new industries have located, we have added them to our list. When there was a favorable opportunity offered, we surveyed the plant of the prospect and prepared a plan for PBX service, and worked out definite recommendations as to type of equipment, number of trunks, number and location of terminals.

When the opportunity offered itself, in connection with change of service, additional service requirements, or some other change in the subscriber's telephone service needs, we presented the PBX proposition. It has taken a considerable length of time to finally close the contract in some cases. For example, we made a traffic study and plant lay-out five years ago for one PBX which we have just sold during the past summer.

As new industries located in the community, we made contact immediately upon the installation of the first telephone service, and suggested PBX service as the ultimate. We have succeeded in installing a number of these.

At the present time, we have in our plant seven PBX switchboards,

all of Stromberg-Carlson manufacture. These consist of one No. 104-C cordless switchboard, four No. 101 and two No. 102 cord type. They have been very satisfactory in operation, and we have appreciated the service we have received from the Stromberg-Carlson Telephone Mfg. Co., both in the delivery of new switchboards and of additional equipment when it became necessary to make additions to present boards."

COMMISSION AND COURT NEWS

(*Concluded from page* 22.)

character that reasonable men might reasonably rely on it, the order should not be enjoined, notwithstanding there may be other conflicting evidence which, to the court, seems to be of equal or greater weight." The order directed that the case be remanded for a new trial.

• • •

Installation Charge on Extension Telephones Reduced

Effective February 1 the New England Telephone & Telegraph Co. will reduce installation charges on extension telephones 50 per cent provided the extension is installed at the same time as the original station. On that basis the charge will be $1.25 for a business extension and $1 for a residence extension.

• • •

Cambridge (Ohio) Company Refund Case Closed

After a period of more than seven years the Ohio Public Utilities Commission has made the final entry in the rate case of the Cambridge Home Telephone Co., of Cambridge, Ohio, following the decision made by that body on November 17, 1927, rejecting the increased rates of that company.

The entry was made January 9 after the telephone company, as a final report, transmitted to the commission a receipt from the treasurer of Guernsey county for $9.22, unclaimed refunds which had passed to the general revenue fund of the county.

The fact that this small amount remained unclaimed of a total of $27,503.77 ordered refunded to the subscribers, as a result of the rejected increased rate of the company, is evidence of the accuracy of the record kept by the company of its subscribers, which is true of many telephone companies.

• • •

Charging Displacements Against Depreciation Fund

On behalf of a number of Independent telephone companies of the state, Gustav Hirsch, consulting engineer of Columbus, Ohio, recently filed a petition with the Ohio Public Utilities Commission, setting up the contention that existing requirements—that displaced stations, interior drops and block wire installations shall be charged against operating revenue—brought about a paradoxical situation.

This, the petition set forth, was due to the fact that many companies have accumulated reserves to care for such situations. The result has been a deferment of removal of discontinued stations, until at present the necessity arises for reconditioning as experience is developed in this field, at least, and that new services are being taken by new subscribers, and not reconnections.

In the petition, the companies ask that they be authorized to charge such displacements against depreciation if accumulated, or through a special suspense amortization account over a period of five years.

• • •

Commission Rulings and Schedule of Hearings

FEDERAL COMMUNICATIONS COMMISSION, WASHINGTON, D. C. (TELEPHONE DIVISION)

January 10: Order issued denying the request of the Chillicothe Telephone Co., Chillicothe, Ohio, to be relieved from compliance with orders of the commission. It was further ordered that the commission assert entire jurisdiction over the Chillicothe company.

CALIFORNIA.

January 3: The Pacific Telephone & Telegraph Co. authorized to increase hours of service and certain rates for service in its Newark exchange.

ILLINOIS.

January 16: Hearing in Chicago on complaint of Herbert S. Mayers and Josephine Mayers against the Illinois Bell Telephone Co., as to classification of telephone service by respondent and request for retroactive reclassification in the city of Chicago.

January 17: Hearing in Chicago on application of the Illinois Bell Telephone Co. for the consent to and approval of a lease to the Art Hosiery Co., Inc., which is not a public utility, of certain described real estate situated at 307 W. Washington St., in the city of Chicago.

January 17: Hearing in Chicago on application of the Illinois Bell Telephone Co., for an order authorizing the issue of $19,000,000 of demand notes.

MISSOURI.

January 9: Approval granted joint application of C. W. Williams to sell and V. F. Garoutte to purchase the Goodman Telephone Co.

January 11: Application filed by Peninsular Telephone Co. to discontinue switchboards and central offices at Cooter and Holland.

January 12: Approval granted application of R. J. Sullins to sell and Richard F. Sullins to purchase the Madison telephone exchange.

NEW YORK.

January 17: Hearings in New York before Assistant Counsel H. M. Chamberlain in the commission's investigation as to the telephone service furnished by the New York Telephone Co. to H. Richard Panzer at Hastings-on-Hudson.

OHIO.

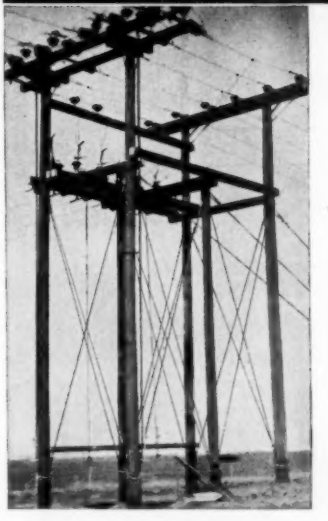
February 14: Hearing on petition of the Johnston Citizens Telephone Co. for authority to sell its outside plant to the North Eastern Ohio Telephone Co. and to abandon its central office at Johnston in Trumbull county. The company in its petition pleaded that its operations are no longer self-sustaining.

OKLAHOMA.

January 24: Hearing on complaint of the city of Garber against the Western Telephone Corp. for an investigation of its rates and service.

Crapo
GALVANIZED PRODUCTS

INDIANA STEEL & WIRE CO. Crapo Galvanized MUNCIE, IND.



Made to Surpass Rigid Specifications

Crapo Galvanized Seven-Wire Steel Strand combines every element essential to dependable, economical line construction and maintenance. The non-cracking, non-peeling *pure* zinc galvanized coating guarantees maximum resistance to corrosion. Proper ductility makes the strand easy to serve. Correct tensile values insure more than ample strength for guys and spans.

These factors are scientifically controlled in all *Crapo* Galvanized Products by vigilant laboratory supervision over each step in manufacture.

You can depend upon genuine *Crapo* Galvanized Steel Strand and Wire to more than meet the most exacting specifications.

Indiana Steel & Wire Co.
Muncie, Indiana

(*Left*) Switching station, Northwestern Public Service Co., Huron, South Dakota. Guyed with *Crapo* Galvanized Seven Wire Steel Strand.

Steel Strand

• • •

Telephone and Telegraph Wire

In order for a telegraph repeater to "repeat" in both directions an arrangement of apparatus, connected as shown in Fig. 8, is required. This repeater consists essentially of two line relays with which are associated two holding coils. The theory of operation of the repeater is as follows:

With the telegraph keys at both stations, *A* and *B*, closed, both repeater relays, *C* and *D*, will be held in the operated position due to the current flowing through them from the line batteries. When these relays are operated it will be observed that one set of contacts on each relay short-circuits the holding coil associated with the other relay. The armature of each relay is, therefore. held in the operated position by the current in the relay coil and not by the holding coil.

If the operator at, say, station *A*, now opens the key and starts sending, current flowing through relay *C* will be interrupted and the armature associated with this relay will fall back. This opens the battery feeding out through relay *D* to station *B*, thus operating the relay at the distant station.

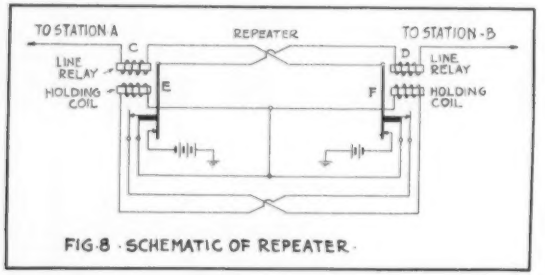


FIG. 8 - SCHEMATIC OF REPEATER.

The falling back of the armature of relay *C* also removes the short-circuit from across holding coil *F* which holds the armature of relay *D* in the operated position during the intervals when the kep at station *A* is open. Station *A* is thus able to telegraph through the repeater to station *B*.

Should station *B* desire to "break" station *A*, it is accomplished by opening the key of station *B*, which causes the armature of relay *D* to open the battery circuit feeding back to station *A*, thus advising that operator that station *B* has opened the line. Operation in the reverse direction is accomplished in the same manner.

We thus have a repeater capable of boosting the telegraph signals at intermediate points in a line, which permits operation in both directions (one message circuit). These repeaters are generally referred to as "single line type." They permit signals to pass in only one direction at a time, as distinguished from other repeaters which permit two-way operation (two message circuits over one wire).

The Polar Duplex Telegraph System

In order to increase the message-handling capacity of telegraph circuits the polar-duplex telegraph system was perfected. This is a system whereby messages can be both sent and received over a single circuit at the same instant. The message capacity of a single telegraph circuit is thereby doubled by means of this system.

Fig. 9 illustrates the basic circuit of the bridge polar duplex system. It will be observed that it consists essentially of a polarized relay, a balanced inductance, pole-changing relay, sounder, key, and artificial line. Basically it operates in a manner very similar to the Wheatstone bridge—the polarized relay being in position similar to that of the galvanometer on a Wheatstone bridge. This polarized relay will respond to currents coming in over the line, but not to currents going out to the line. The actual circuit operation is as follows:

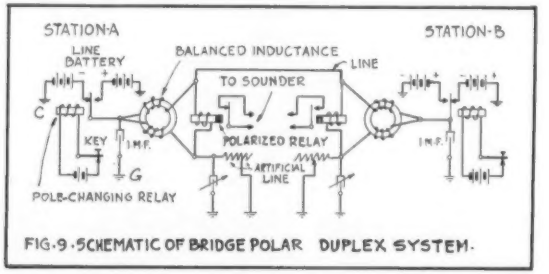


FIG. 9 - SCHEMATIC OF BRIDGE POLAR DUPLEX SYSTEM.

Referring to Fig. 9, assume that both telegraph keys at stations *A* and *B* are closed. This will cause negative battery current to flow out from each station line battery, through the bridge coil and to the distant station where it will flow through the bridged polar relay, operating it. The current from the line battery does not affect its own polar relay as this relay is, in effect, at the balanced point of a bridge circuit as shown in Fig. 10.

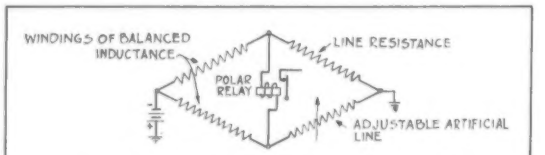


FIG. 10 - ELECTRICAL EQUIVALENT OF BRIDGE POLAR DUPLEX SYSTEM.

It should be particularly noted that it is quite necessary that the artificial line, consisting of resistance and capacity,

be adjusted so as to balance the capacity and resistance of the line; otherwise the polar relay may operate on signals from its own station.

Now, when station *A*, for example, opens its key it releases the pole-changing relay *C*, causing positive battery to be sent out on the line. The positive battery, arriving at the distant station, flows through the polar relay. This relay, being polarized, the armature is thrown to the side opposite from that occupied when negative battery is on the line. This, of course, operates the sounder at station *B*.

Should station *B* wish to send at the same time as station *A*, it can be done without interference for the reasons outlined in a preceding paragraph.

The reason for using polarized relays rather than the non-polarized type is the improvement in signals that is obtained. The polarized relay gives much "cleaner-cut" signals than non-polarized relays. The purpose of the 1 m.f. condenser, shown in Fig. 9, is to reduce sparking at the contacts of the pole-changing relay.

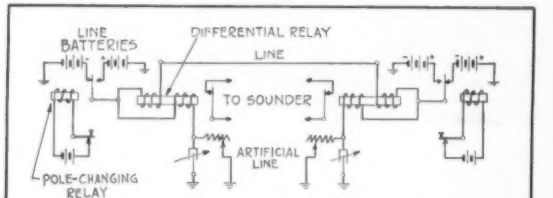


FIG. 11. DIFFERENTIAL DUPLEX SYSTEM.

Polar duplex telegraph systems have the advantage of permitting their use on lines with insulation resistance so low as to be unsatisfactory for the simple closed circuit system.

The Differential Polar Duplex Telegraph System

Another type of system, very similar to the bridge polar duplex type in apparatus required, although based on a different operating principle, is the differential polar duplex system. Fig. 11 illustrates the schematic circuit of a differential polar duplex system.

The differential polar duplex system permits simultaneous transmission and reception of telegraph signals over a single wire. This relay is accomplished by means of a differentially-wound polar relay. This relay is so placed in the circuit that outgoing currents pass through the two windings, but as they are differentially wound the outgoing current does not operate the polar relay. Incoming currents pass through the winding in such manner as to result in added magnetism; hence, the armature of the relay operates.

Condensed Telephone News

New Companies and Incorporations

CENTER JUNCTION, IOWA.—The Center Junction Telephone Co. has reorganized as the Center Junction Mutual Telephone Co., with C. A. McDonald as president, and R. A. Naylor, secretary and treasurer. Directors are: H. J. Dirks, Willis Martin, Guy Driebelbir, Frank Dawes, A. B. Serbousek and F. L. Himebaugh.

HARLAN, KY.—The Cumberland Telephone Co. has been incorporated here with a capital stock of $5,000. The incorporators are: E. H. Mould, A. S. Mould and W. Mould.

OWATONNA, MINN.—Articles of incorporation, contracts and by-laws, incorporating the Milwaukee Rural Telephone Association of Steele county, were drawn up in connection with the annual meeting held recently in this city.

Officers named for the coming year are: C. H. Markytan, president; Robert Pichner, vice-president; George Belina, secretary; John Pichner, treasurer, and John Dusek, director, all reelected; and John Helms, Louis Deml, William Neigebauer and Joseph Pavek, directors for one year.

The association has operated as a copartnership since its organization in 1907.

PETERSBURG, NEB. — The Petersburg Telephone Co. has filed articles of incorporation with the secretary of state.

The company has authorized capital of $10,000 and the incorporators are J. J. Andre, Anna V. Wiegand and Pat J. Carey.

Construction

BOONE, IOWA.—The Northwestern Bell Telephone Co. is sponsoring $17,000 worth of replacements and repairs in this city, the work to last into May. Four miles of cable and 370 poles will be replaced in the residential section.

LISCOMB, IOWA. — The new telephone switchboard, recently purchased by the Liscomb Mutual Independent Telephone Co. at a cost of $712.46, was installed here shortly before Christmas. The board can carry 150 lines and it provides better service for company patrons at no increase in rates.

FORT PECK, MONT. — The newest exchange of the Mountain States Telephone & Telegraph Co., was cut into service here a few months ago with 50 telephones. The central office equipment, a 320-line switchboard and associated equipment, is located in the town hall of the new city.

A week after the cutover the telephone total increased to 140 and when government construction of the 500 modern homes and office buildings is completed sometime within a short while, there will be several hundred telephones in service.

In the matter of toll service to connect the new city with all the rest of the world and provide the needed communication outside for the construction activities, two new copper telephone circuits were strung from Glasgow to Fort Peck and placed in service early in 1934. The project required 85 miles of wire and 440 poles, all of which had to be placed under adverse weather conditions because government engineers needed the service as soon as possible in directing the gigantic undertaking of the construction of the dam.

Additional toll switchboard was installed at Glasgow to care for the expanded service.

Central office equipment at Fort Peck was installed while the building was being completed amid the din and activity of carpenters, plasterers and plumbers. Construction of outside plant also was complicated by the fact that sewer, electric light and other facilities also were in process of construction.

PHILADELPHIA, PA.—Directors of the Bell Telephone Co. of Pennsylvania at their regular monthly meeting late last month approved appropriations totaling $5,063,964 for essential replacements to the company's plant facilities throughout Pennsylvania in the immediate future.

Financial

SAN FRANCISCO, CALIF.—It is reported that the Pacific Telephone & Telegraph Co. had a deficit of $1,279,025, after dividend payments for the 11 months ended with November, indicating a net income of $13,158,475 for the period. This would be equal to $4.79 a share on the common, after preferred dividends, and would compare with $12,840,718 or $4.62 a share in the like 1933 period.

The company had a net gain of 30,757 telephones in the first 11 months last year against a net loss of 59,261 in the like 1933 period.

DENVER, COLO.—At a meeting in December the directors of the Mountain States Telephone & Telegraph Co. declared the regular quarterly dividend of $2 a share on the company's capital stock, payable January 15 to stockholders of record December 31. This dividend has been declared regularly since January 15, 1927.

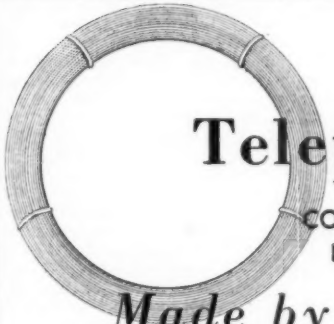
WASHINGTON, D. C.—Total net income of the Chesapeake & Potomac Telephone Co. in the first 11 months of 1934 stood at $1,720,356 against $1,616,978 in the corresponding period in 1933, an increase of more than $100,000, according to the financial report just filed with the District of Columbia Public Utilities Commission.

Operating revenues during the 11 months totaled $8,915,531 as compared with $8,330,635 a year ago. Operating expenses called for $6,273,177 against $5,741,837 a year ago, leaving net operating revenues of $2,642,354 as compared with $2,588,818.

Gross income amounted to $1,955,131 in comparison with $1,899,629 a year ago. Interest deductions required $234,778 against $282,651 in the same period in 1933.

In the same 11 months a substantial increase in the number of telephone calls was noted—217,706,000 compared with 204,941,000.

Washington was served by 187,770 telephones on November 30 as compared with 177,063 on the same date in 1933.



WB

Telephone Wire

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COPPERWELD · BRONZE · COPPER

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Made by Specialists

Trained over many years in the manufacture and development of telephone wires designed to successfully meet the most rigid requirements of the telephone industry. Used by leading telephone companies everywhere.

MANUFACTURED BY

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SOLE SELLING AGENTS IN U. S. A.

Graybar

ELECTRIC COMPANY

OFFICES IN 75 CITIES

FOREIGN DISTRIBUTORS *International Standard Electric Corporation* 67 Broad St., N. Y. City.

There was a net increase of 1,338 telephones during the month of November as compared with 1,615 for November, 1933.

Telephone calls during November of this year were increased 1,054,000 over the same month last year, there having been 20,134,000 calls in November.

Operating expenses totaled $826,160 in November against $785,686 in November, 1933. Operating expenses were higher, being $855,005 compared with $826,336 a year ago.

Net operating revenues amounted to $241,155 compared with $259,350 a year ago. Non-operating income was very small. Total gross income was reported as $176,301 against $195,665 a year ago. Interest deductions took $21,125, this item a year ago standing at $28,034.

After all the usual deductions, balance before dividends, or net income for November amounted to $155,176 against $167,631 in November, 1933.

PALESTINE, ILL.—A dividend of $9.00 per share on each share outstanding was voted recently by the directors of the LaMotte Cooperative Telephone Co. The sum set aside for dividend purposes amounted to $2,124, indicating a distribution to holders of a total of 236 shares. Each share in the telephone company has a nominal value of $25. Last year's dividend was for $6.00.

The increase in the number of telephone subscribers in the past two years is accepted as a sign that conditions locally are improving.

In his report on the condition of the company, Treasurer Matthew Fife mentioned the improvement in service facilities in the past year under the supervision of M. W. Schroy. One of the biggest improvements was the rebuilding of much of the company's lines in Palestine, along with reconstruction on highways.

FARMINGTON, MAINE—The Franklin Farmers' Co-Operative Telephone Co., operating eight exchanges serving 1,162 subscribers, reports total revenues of $22,402 for the year ended December 31, 1934; operating expenses amounting to $18,972, leaving a credit balance of $1,102 cash on hand and $2,327 in accounts receivable. The company's balance sheet shows total assets of $21,653. This includes $18,014 invested in plant and equipment and $557 in the depreciation reserve. The liabilities include $14,240 in capital stock outstanding and an unappropriated surplus of $7,363. Frank Adams is manager of the company.

BALTIMORE, MD.—In November operating revenues of the Chesapeake & Potomac Telephone Co. of Baltimore City, serving the state of Maryland, amounted to $1,089,859. Operating expenses, including taxes, amounted to $864,793. Net operating income amounted to $225,066.

For the first 11 months of the year, operating revenues were $11,744,251 as compared with $11,235,007 for the similar period in 1933. Expenses, including taxes, were $9,323,541 as compared with $8,996,812 last year. Net operating income for the 11 months amounted to $2,420,710 as compared with $2,238,195.

Taxes amounted to $1,468,556 for the 11 months. During November, taxes amounted to $132,806.

Telephone users in Maryland made more than 26,000,000 calls in November, an increase of 1.6 per cent over the number made in the same month last year. There were 204,773 telephones in service at the end of the month, 5,663 more than there were in service on November 30, 1933.

DUNNELL, MINN.—The Dunnell Farmers Telephone Co., of which J. C. Bliesmer is president, Axel Anderson, vice-president, and G. E. Heyman, secretary-treasurer, has issued its financial statement for the year 1934. The statement shows total resources of $4,900.80, including plant and equipment valued at $4,414.01; cash on hand, $329.63; and accounts due from subscribers, $237.16. Against these resources are $4,500 in capital stock outstanding; depreciation reserve, $110.35; exchange service paid in advance, $284.00; surplus, $86.45.

ST. LOUIS, MO.—The net income of the Southwestern Bell Telephone Co. for the 11 months ended with November 30, 1934, was $11,962,393 against $10,864,855 in the corresponding period of 1933, it is reported. Total revenues were $64,405,111 against $61,935,767.

The year just ended was the first to show improvement in telephone business since the decline started in 1930, according to a letter sent stockholders by A. B. Elias, president of the Southwestern Bell Company.

Net gains in the number of telephones in service continued through 1934, the letter said. While these gains have been encouraging, the letter added, they represent only about one-fourth of the stations lost during the long period of losses beginning in June, 1930.

PLATTEVILLE, WIS.—At a meeting last month the board of directors of the Platteville, Rewey & Ellenboro Telephone Co. declared the annual dividend, $10 per share on stock par value $20.

A committee was appointed to organize plans for a new telephone exchange, at North Fourth and Mineral streets to cost, with switchboard equipment, $17,000. The site was purchased for $3,500. The work of constructing the new exchange will be started early in the spring.

Telephones

HARTFORD, CONN.—The Southern New England Telephone Co. had a decrease of 793 stations in service in November, the number being 294,166. This is a gain of 5,239 over the previous year.

ATLANTA, GA.—Atlanta touched a low point in telephones in July, 1933, with 56,675. This figure started upward in August, and reached 58,652 in December. The steady growth continued each month in 1934, and at the end of November there were 64,993 stations in service.

Long distance messages in Atlanta showed even better improvement, progressing from a low of 68,000 messages in February, 1933, to 92,925 in November, 1934.

Figures for the entire state reveal a similar record. The low point in stations of the Southern Bell Telephone & Telegraph Co. was July, 1933, with 121,748 stations, while November, 1934, reached 137,931. On long distance calls for the state, February, 1933, was low with 235,411 messages, contrasted with 345,391 in November, 1934.

INDIANAPOLIS, IND.—The Indiana Bell Telephone Co. has reported that a gain of 4,700 telephones in the Indianapolis area was made last year as compared with a loss of 13,500 telephones in 1933. A gain was made each month last year except June and July.

PATON, IOWA.—Between November 1 and December 19 The Paton Mutual Telephone Co. added 25 new telephones.

The company has also purchased a carload of poles, before the advancement in price, to be used for emergencies and rebuilding of the lines in the spring.

WICHITA, KAN.—Approximately 1,000 new names were added to the December telephone directory here of the Interstate Public Utilities Corp., it has been reported.

NEW YORK, N. Y.—The New York Telephone Co. reports a net station loss of 335 telephones for 1934 against net losses of 119,342 and 191,074 for 1933 and 1932, respectively. The company had a net loss of 34 stations in December against 16 in the like 1933 month and 16,285 in December, 1932.

PHILADELPHIA, PA.—The Bell Telephone Co. of Pennsylvania reports a net gain of 11,917 telephones in service for 1934, contrasted with a loss of 61,237 in 1933. The Diamond State Telephone Co., operating in Delaware, reports a gain of 741 stations for 1934, in contrast with a loss of 675 for 1933.

COLUMBIA, S. C.—During the first 11 months of 1934 new telephones installed in South Carolina increased 1,945 in the Southern Bell Telephone & Telegraph system, according to Thomas Crouch, manager for the central district of the state. The total number of telephones in operation at the end of November, he said, was 43,044.

In Columbia through December 29, Mr. Crouch said, there were 628 new telephones installed showing an increase from 8,163 to 8,791.

MILWAUKEE, WIS.—The Wisconsin Telephone Co. furnished service to 312,310 telephones in 1934, as compared with 306,178 at the end of 1933. In the Milwaukee area the company had 136,080 telephones in service at the close

(*Concluded on page 34.*)

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More than 750 companies have been served.
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JERSEY CITY, N. J.

Buyer's Weekly Guide

A list of firms and companies offering equipment, supplies or services for operating telephone companies

ADDING MACHINES

Burroughs Adding Machine Company, Second Blvd., Detroit, Mich. — Adding, Bookkeeping, Calculating, Billing and Accounting Machines, Electric Carriage Typewriters, Standard Typewriters, Operator Correct-Posture Chairs. Burroughs machines are in use today in hundreds of progressive telephone companies throughout the country.

BATTERIES—DRY CELLS

Bond Electric Corporation, 257 Cornelison Ave., Jersey City, N. J.—Bond Telephone Dry Cells, Bond Flashlights and Batteries, Industrial Flashlights and Batteries, Bond Dry Batteries, Storage Batteries, Voltpruf Special Flashlights for linemen. Victor Telephone Cells and Bond Formula 1216 Inhibitor, ideal for keeping the cooling system of trucks and service cars free from rust, scale and corrosion.

National Carbon Company, 30 E. 42nd St., New York.—"Columbia" Telephone Dry Batteries; "Eveready" Flashlights, Flashlight Batteries and Long Life Dry Cells, "National Pyramid" brushes, carbon, graphite and metal graphite for motors, generators and rotary converters. "Eveready" Prestone anti-freeze; "Eveready" Rustone rust preventive; and "Eveready" Air Cell telephone operators' transmitter batteries.

Ray-O-Vac Company, Madison, Wis.—Ray-O-Vac telephone batteries — longer life and better service proven by tests in accordance with U. S. Government standards and records of users. Ray-O-Vac flashlights and industrial flashlight batteries are other items showing Ray-O-Vac's outstanding quality.

BATTERIES—STORAGE

The Electric Storage Battery Company, Allegheny Ave. and 19th St., Philadelphia, Pa.—Exide Storage Batteries. Branches: Boston, New York, Rochester, Philadelphia, Pittsburgh, Washington, Atlanta, Cincinnati, Cleveland, Detroit, Chicago, Kansas City, Minneapolis, St. Louis, Denver, San Francisco and Seattle.

BATTERY CHARGING EQUIPMENT

General Electric Company, Bridgeport, Conn.—Tungar battery chargers. G-E pole line hardware. Cable filling compound.

CABLE—LEAD ENCASED

British Insulated Cables, Ltd., Surrey House, Embankment, W. C. 2, Factory: Prescot, Lancashire, England.—Telephone cable of all sizes and capacities.

General Cable Corporation, 420 Lexington Ave., New York, N. Y.—Paper telephone cables of standardized manufacture for over forty years. Weatherproof and insulated copperweld drop wire.

Eugene F. Phillips Electrical Works, Ltd., Montreal, Can.—For any type of wire or cable used in telephone, telegraph or power work get in touch with "Phillips." Manufacturers of bare and insulated copper wires, rubber insulated wires, enameled wire, magnet wire, telephone cables, power cables, switchboard cables, flexible cords, copper rods, etc.

CABLE RINGS

National Telephone Supply Company, 5100 Superior Ave., Cleveland, Ohio.—National Cable Rings, National Splicing Sleeves, Non-Breakable Messenger Cable Hangers, Marlin and Swisher Cable Hangers and Custom Galvanizers. National cable rings are practical because they are two-way.—they allow the cable to be pulled in either direction. National sleeves make secure the weakest points in the line. If it's a splice—make it a National.

CABLE TERMINALS

Cook Electric Company, 2700 Southport Ave., Chicago, Ill.—Protective Pole Cable Terminals, Unprotected Pole Cable Terminals, central office protection, lightning arresters, sleeves, fuses.

Reliable Electric Company, 3145 Carroll Ave., Chicago, Ill.—A complete line of telephone and switchboard protectors and specialties. All sizes of cable grips.

CARBON DIAPHRAGMS

Noris Carbon Company, Inc., 160 5th Ave., New York, N. Y.—Carbon diaphragms, carbon back plates, granular and globular carbons, lightning arresters.

CONDUIT

Brazil Hollow Brick & Tile Company, Brazil, Ind.—Makers of Brazil Vitrified Tile. Conduit.

CORDS, CABLE AND WIRE

Lenz Electric Manufacturing Co., 1751 N. Western Ave., Chicago—Established 1904—telephone and switchboard cords for all makes of equipment, braided and lead-covered telephone cable, flame-proof jumper wire, interior telephone wire, switchboard wire.

CORDS AND WIRE

Runzel Cord & Wire Co., 4727-31 Montrose Ave., Chicago—Telephone and Switchboard Cords, Flame-proof Jumper Wire, Switchboard Wire, Interior Telephone Wire. W. L. Runzel, President, has devoted over 40 years to the making of fine telephone cords.

ELAPSED TIME RECORDERS

Calculagraph Company, 50 Church St., New York, N. Y.—Calculagraph is the world's standard elapsed time recorder and gives you toll records printed with elapsed time to the second. Both spring driven and electric motor models are available.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

Alfred E. Cowling, Scotstown, Quebec.—Eastern cedar poles, plain or butt treated.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

Michigan Pole & Tie Company, Newberry and Grand Rapids, Mich. — "Poles with Character." Northern White and Western Red Cedar. Strategically located yards, Minneapolis, Minn., and Reed City (Lower Michigan), insure quick deliveries.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada — Western Red Cedar Poles. Plain or Butt treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or Butt treated.

SUPPLIES, SWITCHBOARDS AND INSTRUMENTS

Automatic Electric Company, 1033 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Telephones, relays, signaling and control equipment.

Automatic Electric Company, Ltd., Milton Road, Edge Lane, Liverpool, England.—Automatic Telephone Equipment.

Automatic Electric Sales Company, Ltd., 1027 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Manual Telephone Equipment, telephones, storage batteries, wire, cable, poles, etc.

Kellogg Switchboard & Supply Company, Adams & Aberdeen Sts., Chicago, Ill.—Engineers and designers, manufacturers and suppliers of complete equipment for telephone exchanges and communication systems. Manufacturers of "Master-built" Common Battery, Magneto and PBX Switchboards, "Masterphone" Telephone Instruments, and a complete line of telephone supplies, including bronze drop and interior wire.

North Electric Manufacturing Company, Galion, Ohio—Machine switching telephone systems. Automanual and Automatic. "All-Relay" Switching Apparatus (Dialless and Dial Control). Unattended Satellite Systems.

Siemens Brothers & Company, Ltd., Woolwich, England—Automatic and Manual Telephone Equipment.

Stromberg-Carlson Telephone Manufacturing Company, 100 Carlson Road, Rochester, N. Y. — Telephone apparatus of all kinds, switchboard cords, cable and general telephone supplies.

TOOLS

Crescent Tool Co., Jamestown, N. Y.—CRESTOLOY Pliers, Curved Needle Nose Pliers, Heavy Diagonal Cutting Pliers, Linemen's Side Cutting Pliers, End Cutting Nippers, Crescent Hack Saws.

TRANSMITTER REPAIRS

The Telephone Repair Shop, 1760 Lunt Ave., Chicago, Ill.—Transmitters completely rebuilt and arranged for either magneto or C. B. service. Transmitter fronts and backs refinished in black. Transmitter buttons cleaned and refilled. Receivers repaired; ringer coils and generator armatures rewound.

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Western Elec. No. 46 Common Battery Induction Coils @ $0.55

Kellogg No. 79 Common Battery Ind. Coils @ ..... .45

Stromberg-Carlson No. 27A Receiver with repolished shell and New Cord @.... 1.10

Western Elec. No. 143 Receiver with repolished shell and New Cord @..... 1.00

Kellogg No. 41 Slip type Receiver with repolished composition Shell and New Cord @ 1.10

Am. Elec. slip type Receiver with repolished shell and New Cord @..... .85

Kellogg No. 118 desk set with Dean, Trans. and Rec., complete with W. E. No. 240 3-bar 1000-1600 or 2500 ohm external post connection signal set @ 7.50

Kellogg No. 2696 type 4-bar 1000 or 1600 ohm Bdg. Compacts @ 8.00

Kellogg No. 97 C. B. desk set with No. 75 Straight line steel bell box @..... 7.00

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With balanced coil. Locates shorts, crosses, grounds and wet spots; also tone circuit.

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FOR SALE—New Mexico telephone proposition. Two exchanges operating. Franchise covering other communities. Equipment in wareroom for further development. D. L. Groce, Glasgow, Missouri.

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WANTED—25 or 50 Cook terminal can pencil fuse, 16 or 25 pr. used lead covered cable; must be good. Mullinville Telo. Co., Mullinville, Kans.

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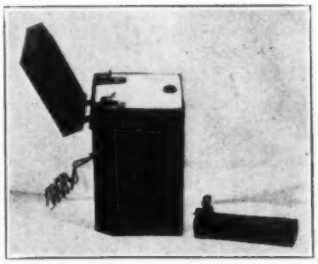

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(Concluded from page 32.)

of 1934, compared with 133,543 at the end of the preceding year. Other state companies are serving 150,040 telephones, compared with 147,830 a year ago.

In 1934 the Wisconsin Telephone Co. handled 7,895,000 long distance calls. In 1933 the total was 7,353,377.

The company spent $2,000,000 on construction during 1934 and at the end of 1934 operated 1,510,000 miles of wire in the state. It is estimated $3,400,000 will be needed for construction in 1935, of which amount $2,525,000 will be for exchange service work and $875,000 in the long distance service.

Miscellaneous

UNION CITY, IND.—The Interstate Telephone Co. of this city, which for years has maintained a small exchange at Lightsville, Darke county, recently disclosed that its village branch had been discontinued. Changes in toll rate regulations necessitated the act and the 28 Lightsville telephone subscribers are now being served by the Union City exchange.

MOUND VALLEY, KANS.—O. E. (Red) Recob, manager of the Kansas Telephone Co. here, has assumed the added management of the Kansas Home Telephone Co. exchange at Altamont, succeeding Fred Doty who has been transferred.

Both the Kansas Telephone Co. and the Kansas Home Telephone Co. are in receivership, and the receivers evolved the idea of merging the managerships of several properties of the two companies where the properties are located in nearby towns. The manager of the Kansas Home Telephone Co.'s Altoona exchange will now take over the added job of managing the Kansas Telephone Co.'s property at Thayer.

BROOKSVILLE, KY.—Printing telegraph machines, working directly with Postal Telegraph relay centers, have been installed in the telephone exchanges of the Kentucky State Telephone Co. at Hazard, Morehead and Berea. These offices serve as "telegraph centers" in the same way that certain offices serve as toll centers for telephone toll service.

Obituary

MAQUOKETA, IOWA.—Grace Knittle, 57, manager of the Northwestern Bell Telephone Co. here for more than 20 years, died on December 18 in a hospital at Davenport of a complication of diseases. She was believed to be the only woman telephone manager in eastern Iowa.

Miss Knittle was born in Maquoketa on June 18, 1877. She became an employe of the Home Telephone Co. here soon after her graduation from high school in 1895. In 1913, when this company was absorbed by the Northwestern Bell company, she became manager.

SAVANNAH, N. Y.—Shocked while working on a telephone line here more than two years ago and ill since that time, Lewis E. Barnett, 32, former president of the Savannah Telephone Co., died on December 31 at his home in Syracuse.

While working on a "dead" line in Savannah, November 14, 1932, Mr. Barnett was shocked when the current was turned on. Taken to an Auburn hospital and to a Syracuse hospital several weeks later, he underwent a long series of treatments.

Mr. Barnett was a member of Savannah Lodge, 764, Masons, and Griswold Chapter, Royal Arch Masons, of Clyde.